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ORIGINALITY, INTELLIGENCE, AND PERSONALITY

by

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ABSTRACT

The concept of creativity is one which has received a great deal of attention in recent years, although there are still a number of unresolved issues in this area. The present study is concerned with originality, a more objective notion than creativity, and so avoids problems associated with the low reliability and validity of creativity tests. Furthermore, findings of earlier studies have often been limited in their usefulness, because of variance restrictions resulting from the homogeneous samples employed. The purpose of the present study was to investigate the relationship between originality and conventional intelligence, to establish the dimensionality of originality, and to show the personality correlates of originality.

The sample consisted of 320 children, who comprised the entire grade seven population of a large Edmonton Junior High School. Data collected included scores on six measures of originality, a number of measures of conventional intelligence, and a battery of personality and cognitive tests. These scores were subjected to factor analysis and discriminant function analysis.

The major findings of the study were as follows:

1. Originality tests overlapped to a marked degree with conventional tests of intelligence.

2. Despite the significant correlations between intelligence and originality, the data yielded significant factors of originality in the case of boys' and girls' data separately, and also in the case of the full sample's data.

3. The boys' data yielded two orthogonal factors of originality, whereas the girls' data yielded only a single factor. The boys' factors were tentatively labelled 'non-verbal originality' and 'verbal originality', respectively.

4. Highly original subjects differed from unoriginal subjects in that they were more extraverted, more impulsive, possessed wider categories, were more willing to take risks, and were more non-conformist.

The findings were interpreted as indicating that there is a separate domain of originality, although it is highly correlated with conventional intelligence. This domain is more highly differentiated in boys than in girls. Furthermore, there is a typical kind of personality which characterizes highly original individuals, who tend to be impulsive extraverts.

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CHAPTER 1

INTRODUCTION

Creativity is a subject which has received increasing attention in recent years, because it lends special dignity to the human being in this computer age (Bruner, 1962). The present study is concerned with an investigation of 'original' behaviour, a term which is preferred because it implies merely an adaptive response marked by statistical uncommonness, whereas the label 'creativity' implies value judgements in which the response is required to meet aesthetic or professional criteria[1] (Maltzmann, 1960; Mednick, 1962; Taylor, 1964). Furthermore, Mackler (1962) has shown that originality measures are satisfactorily reliable, whereas there is little evidence of the reliability of creativity tests, while Vernon (1964, p. 168) has made a similar point concerning their validity.

Despite some dissenting opinion - which holds, for example, that the kind of behaviour usually labelled 'creative' may be distinguished only loosely from that subsumed under the concept of 'intelligence' (Thorndike, 1962; 1963; Marsh, 1964) - several authors have concluded that original behaviour depends upon more unique cognitive factors (Guilford, 1950; Lowenfeld, 1958) or upon certain personality characteristics (Freud, 1910; Couch & Keniston, 1960; McGuire, 1961; Cattell, 1963). Furthermore, a number of studies (Barron, 1955; Guilford, 1959; Torrance, 1962; Cattell, 1963) have reported the presence of consistent correlates

[1]Throughout this thesis, the term 'creative' will be used only in summaries of positions taken by authors who prefer the usage, but even then it will be taken to mean 'original'.

of originality in questionnaire responses, and significant intercorrelations among these measure, findings which permit the inference that there is a separate, quantifiable 'creative' aspect to the kind of behaviour sampled.

The traditional measures of intellectual capacity are heavily saturated with 'convergent thinking' (Guilford, 1959, p. 470) skills, requiring mainly reproduction of previously learned material and not important in creative behaviour (Guilford, 1950, p. 447). However, it has been pointed out (Torrance, 1962, p. 4; Getzels & Jackson, 1962, pp 4-6) that there is a growing list of studies which indicate that intellectual functioning derives a good deal of its variance from abilities other than those associated with performance on conventional IQ tests, and there is increasing recognition that creative thinking abilities contribute importantly to intellectual functioning.

In summarizing opinion to this effect, Getzels and Jackson, (1962, p. 2) point out that the concept of giftedness is frequently associated almost exclusively with high IQ, although it is usually recognized today that IQ tests sample only a narrow band of intellectual skills, and normally account for only about one quarter of the variance of variables like school achievement. IQ tests are so bound to traditional conceptions of the nature of intellectual functioning that it is usual to measure the validity of new intelligence tests by correlating them with old ones, thus eliminating the possibility of measuring aspects of intellect not measured by older tests.

Getzels and Jackson (1962, p. 5) refer to the findings of a number of studies which attempted to compare performance on tests of

originality with performance on tests of intelligence, and they report correlations ranging from .02 (Andrews, 1930) to .27 (Welsh, 1946), while correlations between their own battery of five creativity measures and conventional intelligence ranged from .131 to .378 (1962, p. 20). On the basis of the data yielded by their sample, Getzels and Jackson concluded that creativity and intelligence are relatively independent.

However, the Getzels and Jackson study has been severely criticized on a number of grounds (Burt, 1962; De Mille & Merrifield, 1962). Furthermore, factor analyses of their data (Thorndike, 1963; Marsh, 1964) have failed to yield a separate factor defined by the measures of creativity, and at the same time substantially independent of IQ. In fact, several studies (Ripple & May, 1962; Richards, Cline & Needham, 1964) have shown that a number of Guilford-type creativity tests are substantially correlated with intelligence, and Meer and Stein (1955) also obtained significant correlations between originality and intelligence. Pribram (1964, pp. 107, 108) has summarized the relationship between 'convergent' and divergent' thinking, by pointing out that there is no neurological basis for regarding the two as separate, but rather that novelty only exists against a background of the already known (1963, p. 161), and that creative thinking ('divergent thinking') occurs when conventional ideas ('convergent thinking') are carried to their utmost limits, and new boundaries perceived, which lie beyond the previously accepted limits.

In discussing the relationship between intelligence and achievement, McClelland (1958, pp. 12-13) has emphasized that, at high IQ levels, productively successful and unsuccessful individuals do not

differ as far as IQ is concerned. He suggests that beyond some minimum level, IQ no longer matters as far as success is concerned, and uses the term 'threshold variable' to describe the role of intelligence in predicting future success. That is to say, once an individual has reached some minimum level (threshold) in intelligence, success is determined by other factors. This point of view has been extended to originality by Vernon (1964, p. 166), who suggests that, although originality and intelligence may well be highly correlated at lower levels of intelligence, they are probably independent once some minimum IQ has been reached. He suggests 120 as approximately the IQ beyond which originality and intelligence become independent.

Taylor (1964, pp. 35-36) has summarized the relationship between creativity and intelligence by pointing out that, although the correlation between creativity tests and intelligence tests is generally of the order zero, or even negative, when samples are homogeneous with regard to IQ, so that IQ test variances are small, correlations obtained are usually significant in the case of heterogeneous samples.

Attempts to study original behaviour have made use of a number of criteria of originality, including production of statistically uncommon test responses (Terman, 1925; Guilford, 1954; Barron, 1953a; Torrance, 1962), production of works generally acknowledged as 'creative' (Rossman, 1931; Clifford, 1958; Cattell, 1963), general acclaim for 'creative' eminence (Freud, 1910; Sharpe, 1950), pursuit of acknowledged 'creative' activities (Eiduson, 1958) or merely unusual (seldom observed) behaviour (Barron, 1955; Mednick, 1962).

At present there is no complete agreement on what constitutes originality. Many different conceptions have been advanced (Campbell, 1960; Gordon, 1961; Bruner, 1962; Mednick, 1962; Neisser, 1963; Taylor, 1964), while it has been suggested on the one hand, that originality is a unitary trait (Gordon, 1961; McGuire, 1961; Sultan, 1962) and on the other that it has at least two, and possibly many, dimensions (Guilford, 1959; 1960; Torrance, 1963; Taylor, 1964; Anderson, 1964). Thorndike (1962) has even suggested that the dimension of creative thinking is at best a nebulous and loosely formed domain, and (1963) that there is some doubt that 'creativity' tests do in fact sample a clearly defined, separate dimension of intellect.

Hence, although Gordon (1961, p. 5) has argued that originality is a unitary trait and that creative productions in all areas reflect the operation of the same fundamental psychic processes, Taylor (1964, pp. 7, 23) contends that originality is a multidimensional concept. Referring to Ghiselin's (1959) study, in which he demonstrated the existence of a verbal originality factor and speculated that an analogous non-verbal factor may exist, Taylor suggests (1964, p. 22) that there are probably at least two major dimensions of originality.

This speculation has been supported by the findings of Anderson (1964). He obtained two originality factors from the response of a sample of grade eight children, identifying them as verbal originality and non-verbal originality, respectively.

Some theorists (Guilford, 1950; 1960; Torrance, 1963) argue that there are not merely two factors involved in originality, but that there may be as many as 13 factors (Guilford, 1960) which account for

the variance of creativity tests. Among the factors which Guilford lists are Sensitivity to Problems, Ideational Fluencey, Flexibility of Closure, and Originality, while Torrance (1963, pp. 97-98) has also added Penetration, Analysis and Synthesis, and Redefinition.

On the other hand, both Thorndike (1963) and Marsh (1964) were unable to obtain any originality factor from the intercorrelation matrix reported by Getzels and Jackson (1962, p. 20). Although a factor on which the creativity measures loaded highly was obtained, much of this factor's variance was accounted for by the conventional IQ measures. Furthermore, Sultan (1962) was unable to obtain more than a single, relatively insignificant factor of originality in a battery of 40 tests, including a number of Guilford measures, which were administered to a sample of English second and third year Grammar School students. Thorndike (1963) has suggested that, although creativity tests do tend to inter-correlate significantly, there is little evidence that they define a separate dimension of intellectual functioning.

A further interesting speculation about the dimensionality of originality has been advanced by Taylor (1964, p. 23). He suggests that differences in originality between individuals may be regarded as resulting from quantitative differences along some continuum of originality, rather than from qualitative differences involving the presence or absence of originality. This point of view attributes to originality properties also assigned to the more conventional concept of intelligence. Lowenfeld (1957) has extended this comparison by suggesting that there are two kinds of originality - actual and potential creativity, a point of view which is highly comparable to Hebb's (1958) concepts of Intelligence A and Intelligence B.

The present study is partly concerned with an investigation of the relationship between originality and intelligence, and with the dimensions of originality. Other studies (Getzels & Jackson, 1962; Sultan, 1962), which have been concerned with the same issues, are of limited value in view of the restricted range of IQs sampled (full sample mean IQ in the Getzels and Jackson (1962, p. 24) study, for example, was 132). The consequent restriction of test variances has been reflected in the factorial studies (Thorndike, 1962; Marsh, 1964) based on the Getzels and Jackson data. Furthermore, studies which deal with 'creativity' as the independent variable are necessarily restricted in the extent to which their findings can be generalized, because of the doubtful reliability (Mackler, 1962) and validity (Vernon, 1964) of 'creativity' tests.

In the present study, however, sample IQs are considerably less homogeneous (range - 79 to 150; mean - 114.3; SD - 14.5), and the concept of creativity has been made more objective in the notion of 'originality'. Hence, it is argued that the present author has avoided some of the more fundamental errors inherent in studies already discussed, and that the present findings will be more readily generalizable.

The second aspect of the present study is connected with the relationship between cognitive functioning and originality, and personality and originality. A number of superficially different conceptions of the cognitive (Osgood, 1953, pp. 701 - 705; Hebb, 1958; Bruner, 1962, pp. 23-30) and personality (Freud, 1919; Couch & Keniston, 1960; Cattell, 1963) organizations underlying original behaviour have been advanced. Consequently, the purpose of the present study is to develop a unifying

theory of originality, and, having demonstrated that originality exists as a separate and clearly defined dimension of intellect, to show that highly original and highly unoriginal individuals differ in terms of a number of personality dimensions based on the author's cognitive position.

CHAPTER II

RELATED LITERATURE

Theorists represent behaviour in differing ways, and so differing representations of original behaviour have been advanced. S-R theories (Thorndike, 1911; Pavlov, 1927; Watson, 1930; Skinner, 1953) account for human behaviour in terms of bonds or links between stimulus and response, although they disagree concerning the mechanics of bond formation, and although such theories seem, at a superficial level, to eliminate the possibility of original behaviour except as a function of chance, it is possible to formulate theories of originality even within the S-R framework.

Mednick (1962) has advanced a theory of originality which is essentially of an associative sort. He defines original thinking as involving the formation of associative combinations characterized by remoteness of the associative elements. Although elements may come into combination through accidental contiguity[2] (1962, p. 221) the probability of a particular combination occurring will generally be a function of the organization of an individual's associations.

More specifically, Mednick suggests (1962, p. 222) that, for any particular word, different individuals will possess differing associative hierarchies of 'associative response strengths'. In some individuals the probability of occurrence of the dominant association will be very high and the gradient of the hierarchy of response strengths very

[2]Hebb (1949, p. 219) has suggested that the term 'serendipity' is now well established as a label for this phenomenon, and may be used to refer to it.

steep, whereas in others, relatively low probabilities of more contiguous associations, and less rapid fall off in associative response strengths will permit going beyond the more dominant reponses to less obvious, more original, associations.

On this basis, Mednick has designed a test of originality based on the assumption that the highly original individual will be capable of making more associations to words, and that remote associations will be more readily available. In each item of Mednick's test - the Remote Associations Test (RAT) - subjects are presented with three words which have some common association, and they are required to find a fourth word which has associative links with all three of them.

The RAT has been roughly standardized by Mednick (1962, pp. 228-230) and has a number of interesting correlates which add to its construct validity. The test correlated significantly with faculty ratings of the originality displayed in a Design course by students of Architecture, and with faculty ratings of research creativity of first year graduate students in psychology, while it correlated significantly and negatively with college grades. Kowalski (1960) showed that high RAT scorers were more 'liberal' in their views than were low scorers, and that they expressed significantly more interest in 'creative' occupations like artist, psychologist and journalist.

It is also possible to formulate a theory of originality in terms of operant conditioning. Thus, Bandura and Walters (1963) emphasize that behaviour is acquired chiefly through differential reinforcement of children's responses, originally emitted in imitation of models whom they observe. Consequently, the behaviour of a child will be shaped according

to the particular patterns of reinforcement which he receives; hence, consistently original behaviour would reflect a particular kind of model, and a particular pattern of reinforcement. This point of view leads to the suggestion that highly original children would enjoy a characteristic kind of home background, in which deviant behaviour is both observed by the child, and reinforced by the parent.

However, although the S-R position provides a useful basic approach to the study of behaviour, mediational variables must be considered for a more adequate representation of originality (Hebb, 1960, p. 739). For example, Smith and Raygor (1956) demonstrated that the capacity to go beyond immediately contiguous associations is subject to cognitive controls. They obtained significant increases in the number of remote associations made by a sample whose members had first been satiated on common associations by being required to produce large numbers of them, and they showed that subjects who had been instructed to seek less obvious associations made more original responses.

Although his test is not obviously influenced by this view, since the responses required involve essentially S-R links between words, Mednick is himself aware of the fact that mediational variables are necessary to account for much of human behaviour (1962, p. 222). However, writers are at odds concerning the nature of the mediational unit. Thus, Mednick (1962) and Berlyne (1963, p. 177) stick to the Hullian position (1930; 1937) that there is some kind of abbreviated, internalized anticipatory behaviour; a position which is still consistent with behaviourism, since the components of this unit, the r_g (or r_m) and s_g (or s_m) are simply small Rs and Ss.

However, another representation of the mediational units is to be found in Pavlov's (1941, pp. 113-114) concept of the second signal system. In the case of classical conditioning, which involves operation of the first signal system, previously neutral stimuli, like sights and sounds, can come to evoke strong responses if they signal the approach of an event of biological importance. Thus, a dog comes to salivate at the sound of a bell alone, when the sound has frequently been followed by the subsequent presentation of food; the bell has become a signal of food.

The second signal system, on the other hand, involves verbal behaviour. Just as the sound of a bell comes to signal the impending appearance of food, the word 'bell' becomes a signal of the sound of the bell. In other words, the word 'bell' becomes a signal of a signal. Ivanov-Smolenski (1951) showed that children conditioned to respond to the sound of a bell, would respond to the word 'bell' alone, without any further conditioning. Conversely, conditioning to the word 'bell' would be accompanied by generalization to a real bell.

Furthermore, a number of Soviet experimenters (Berlyne, 1963, pp. 170-174) have observed that generalization between words occurs very frequently. Not only will a response generalize from the spoken to the written form of a word, but generalization occurs to words similar in meaning to the original second signal (word), the degree of generalization being a function of the similarity in meaning between the two words.

In fact, Razran (1961, p. 100) has pointed out that responses conditioned to words by 'semantic conditioning' generalize much more readily to words similar in meaning than to words which are phonetically

or structurally similar. Thus, although generalization of a conditioned salivary response does occur from 'style' to'stile', for example, generalization to 'fashion' is much more marked.

Consequently, a particular word tends to elicit responses associated with many other words, with which it has similarities of meaning. In this way, a particular verbal stimulus can be associated with a complex structure of responses, in a way which cannot be accounted for by a purely S-R theory.

There are two major ways of representing the second signal system and its effects on behaviour. The first is the neo-behaviouristic way of Osgood, who has considerably amplified the role of mediational processes in stimulus-response connections (1953; 1957). He suggests that a response regularly and reliably elicited by a particular stimulus (a significate), may be divided into a stimulus-specific part and a detachable part. When another stimulus is presented contemporaneously with the significate, some of the detachable parts of the response to the significate may move forward in an anticipatory way and attach themselves to the new stimulus, which thus becomes a 'sign' of the significate.

In this conception Osgood makes use of Hull's (1930) concept of the 'anticipatory goal response'. He goes on to argue (1953, p. 696) that the fractional anticipatory response (r_m) may elicit a stimulus (s_m) which becomes conditioned to the original response associated with the significate. In this way, the sign eventually acquires the capacity to elicit the response originally evoked by the significate, even in the absence of the significate, as a result of the attachment to it of fractional representational components of the significate.

An example of this process occurs when a small child learns the 'meaning' of the word 'ball'. Initially, presentation of the object 'ball' (a significate) elicits certain behaviour (squeezing, bouncing, rolling etc). Frequent pairing of the word 'ball' with the object results in the attachment of anticipatory squeezing and rolling response to the word alone, even in the absence of the real object. In this way, the word becomes a sign of the actual object.

Osgood further evokes the Hullian concept of the 'habit-family hierarchy' in suggesting that the detachable components of a number of significates may be variably associated with a particular sign, in a 'divergent hierarchy of responses', so that it comes to acquire a variety of 'meanings'. Where sign and r_m are associated with variable probability, the probability of a given stimulus-response association will be a function of the frequency with which they have been associated in the particular individual's experience, their proximity, and the amount of reinforcement accompanying their pairings.

A word is said to have 'meaning' when it shares common mediational processes with a significate or a meaningful sign. Consequently, a particular word will have a range of 'meaning', since it evokes mediational processes associated with a number of significates and other signs. Figure 1 (Osgood, 1953, p. 631) represents diagrammatically the way in which a single verbal sign (STICK) may be associated with a number of 'ways of perceiving', each of which is, in turn, associated with a number of 'potential functions', so that the single word may come to have a wide range of 'meanings'.

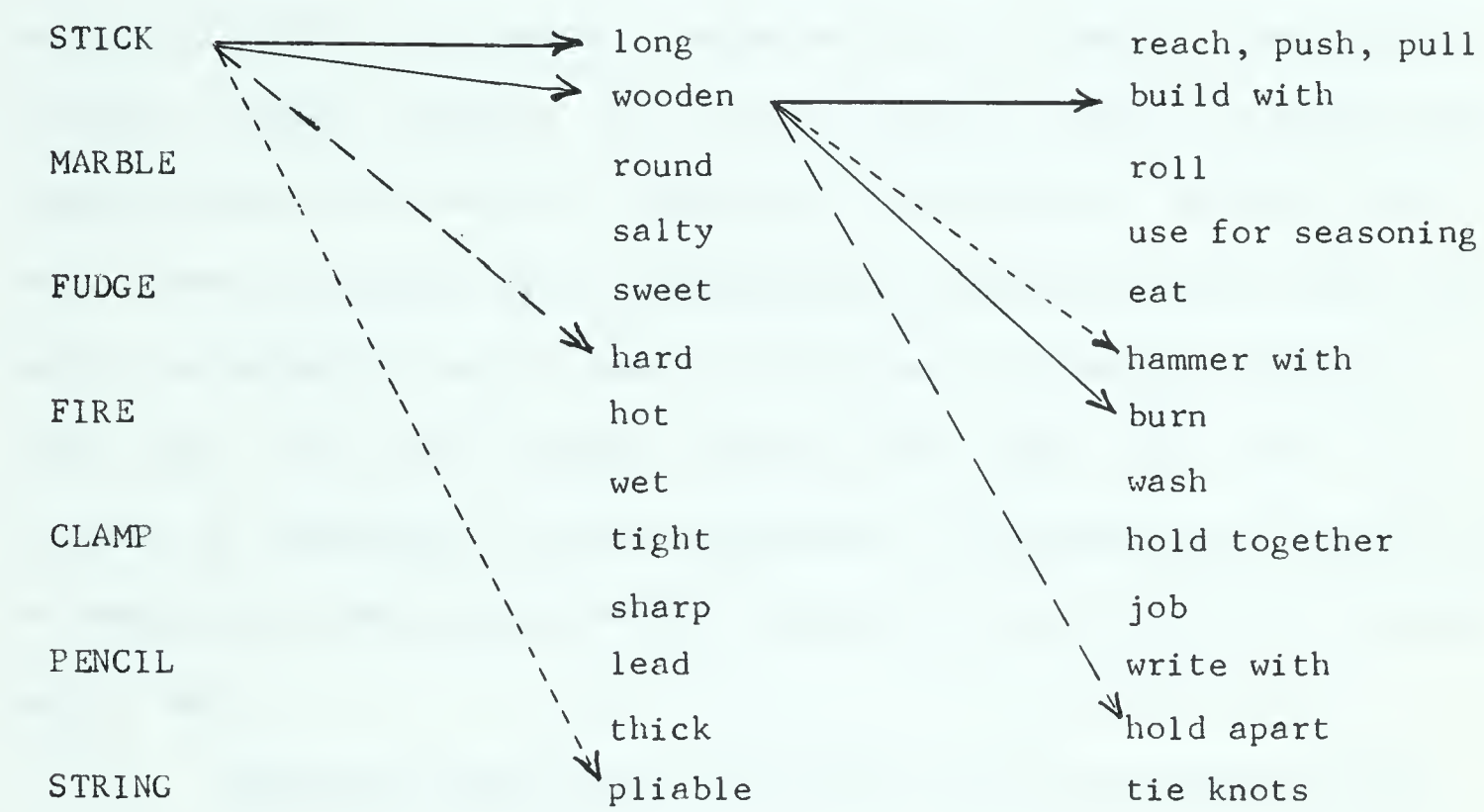

Figure 1. Mediational model of problem-solving. Objects (or labels of objects) as signs are associated with hierarchies of representational mediators (ways of perceiving objects or their significance) which in turn elicit readiness for executing a hierarchy of instrumental skills.[a]

[a] (Osgood, 1953, p. 631)

It is apparent that a mediational model like Osgood's is able to take account of a considerably wider range of responses than an essentially reflexive approach. The highly original individual would be expected to possess a greater repertoire of associations and to be able to discern overlap in meaning between words which appear, to the individual whose mediational scope is narrower, to be quite discrete. Consequently, an associations test was constructed for the purpose of this study and was included in the battery of tests employed. Subjects were presented with three stimulus words and required to find a fourth word

which shared common mediations with all three; it was argued that highly original subjects would produce a greater number of appropriate responses.

Osgood's position is still essentially a behaviouristic approach, with word meaning, for example, accounted for in terms of 'associative clusters' (Bruner, 1963, p. 125) in which words, objects, or events get bonded together by virtue of similarity or contiguity. On the other hand, there is another way of representing the second signal system, in which the mediating unit is seen as involving rule-making (Vygotsky, 1962; Luria, 1959, 1961; Bruner, 1957a; 1957b; 1960; 1962; 1963). As the unit of mediation, the rule represents a parsimonious and flexible way of symbolizing the internal events involved in the processing of environmental data.

Vygotsky (1962) and Luria (1959; 1961) have emphasized the role of speech in such rule-making. Vygotsky distinguished the role of speech in affecting the behaviour of others from its role in affecting one's own behaviour, and pointed out that the use of language to control oneself does not require overt vocalization, but that this purpose may be served by inner speech. Although thought and inner speech do not coincide, they certainly interact and influence each other intimately. In fact, the child first begins by allowing his behaviour to be regulated by speech of others, and as he matures, he comes to use speech to direct his own behaviour.

Luria (1959) emphasizes that human children develop in a highly socialized context, and argues that the basic form of mental development in the child consists of the acquisition of other people's experience through the mediation of speech. The child's acceptance of adult verbal-

izations renders his personal reflection of reality much more comprehensive than it would be if subserved by first-hand experience alone, and so the child benefits from the accumulated experience of past generations by adopting their experiences into his own cognitive framework. These experiences are acquired vicariously through the medium of adult verbalization.

In this way, interaction with the environment is rendered more complex by, and is largely regulated by speech. As the child matures, he becomes increasingly capable of controlling his own behaviour, at first through the progressive internalization of external verbalizations, and ultimately, in the mature individual, through self-generated verbal rules. At this level, internal verbalization renders the individual capable of independent self-regulation.

Since the behavioural rules are first learned through interaction with mature members of the culture, they reflect conventional cultural orientations in most cases, and serve to stabilize behaviour and limit inter-individual variation. However, verbal rules which are permissive and flexible permit original behaviour, although possibly at the risk of unconventionality and social disapproval. Thus, in this point of view, originality is directly related to the internal verbalizations with which the individual regulates his behaviour.

Even within an avowedly 'socio-behaviouristic' framework such as that of Bandura and Walters (1963), it is possible to see implicit the concept of verbal mediation as an important source of learning. In discussing social learning, they emphasize the importance of a model, whose behaviour is imitated by the learner. However, although there

may be cultures in which children learn only what adults show them (1963, p. 49), our culture makes extensive use of symbols in the acquisition of 'patterns of behaviour' (1963, p. 51), and the major system of symbols consists of speech.

Bruner too (1963, p. 126 stresses that the perception of relationships between events is a rule-making process, and (1960; 1962) that the defining attributes of originality are largely to be found in the nature of the perceptual processes involved.

He argues (1957a; 1957b) that people do not treat masses of incoming stimuli as individual events, but that they are coded into categories on the basis of grouping strategies, and he has outlined (1963, pp. 128-134) three major strategies which individuals utilize in coding. The first of these is 'superordinate concept formation' (1963, p. 129), in which a number of items are grouped on the basis of one or more properties common to them all and descriptive of them all; for example, the definition of bell and horn as both noise-makers. 'Complex formation' (1963, p. 130) involves the use of selected attributes of each item, without suggesting that this really typifies the whole array; for example grouping bell, horn and newspaper by saying that bell and horn are both capable of making noise, and that a newspaper makes noise if it is crinkled. The last form of grouping is 'thematic grouping' (1963, p. 132) in which all elements are combined into a single theme, like the following attempt to relate coat, sweater, umbrella, house and infection; "If you get an infection, you wouldn't go out of the house, but if you did, you'd take an embrella if it were drizzling and wear a coat and sweater". (1963, p. 132).

Thematic grouping of elements is scarcely a more parsimonious way of grouping sensory information than merely listing its elements

separately. The same is true of formal grouping. The most efficient grouping strategy involves superordinate concept formation, in which input data are coded together on the basis of identical elements or satisfaction of some minimum criteria of functional equivalence. Bruner has shown (1963, pp. 135,136) that this kind of grouping is increasingly utilized as maturity increases; thus, in this conception, increasing experience involves, not a steady increase in the complexity of cognitive functioning, as associationist theories suggest, but increasing simplification marked by the growth of strategies that encode information in a parsimonious manner.

The function of coding is to create a parsimonious model of input which utilizes grouping to reduce the 'cognitive strain' (1963, p. 134) of information processing, and helps the individual to make sense of the world. Accordingly, the consistent use of learned codes represents habitual cognitive functioning which provides increasingly simplified rules to govern information processing.

Hence, the function of coding is 'to minimize the surprise value of the environment' (1957b, p. 133). On the other hand, originality, which permits the individual to go beyond common ways of experiencing, (1962, p. 22), involves grouping (combinatorial) activity in which components are rearranged in a novel and unexpected way, not to reduce surprise, but to produce 'effective suprise' (1962, p. 19) which has three dimensions. The first of these (1962, p. 19) is 'predictive effectiveness' which reduces the uncertainty in the environment by showing some way in which one set of events leads to another. An example of this kind of effectiveness is the formula $s = \frac{1}{2}at^2$, which permits prediction with high levels of accuracy of the position of a

falling body at a given time after release.

The second kind - 'formal effectiveness' - consists in systematically ordering elements in a new way, in seeing relationships not seen before (1962, p. 19). Originality involving this kind of effectiveness occurs when a relationship is seen to exist between two phenomena not previously known to be related, so that out of the newly perceived commonality a new principle emerges. The quantum theory, or Einstein's theory of relativity are examples of such effectiveness, which is most frequently found in science.

'Metaphorical effectiveness', the last sort (1962, p. 20) consists in linking domains of experience not previously connected, but in a visionary way which distinguishes it from 'formal effectiveness' and reveals relationships hitherto not merely unexpected, but unsuspected. This kind of effectiveness, most commonly found in the arts, occurs for example in the linking of sickness and beauty in Der Tod in Venedig (Mann, 1913).

Thus, Bruner stresses the role of combinatorial activity in originality. However, he points out (1962, p. 20) that he is not thinking in terms of blind permutation of all possible category combinations; rather he sees original behaviour as involving combining the elements of a problem on the basis of perception of the entire problem rather than analysis of its components (1960, p. 58) and the simultaneous handling of all the elements of a problem as a unit, rather than as discrete elements. In a similar vein, Maslow (1954, pp. 261 - 291) argues that there are two main types of perception, generic perception, or 'rubricizing' (1954, p. 261), and idiosyncratic perception, in which each stimulus is viewed as a unique event. He suggests (1954, p. 283) that generic perception,

which involves categorization of stimuli in the same sense as Bruner uses the term (1957a; 1957b) inhibits creativity, since it involves responding to the stereotyped aspects of the world. On the other hand, responding to each stimulus as an unique event permits gaining fresh insights, and fosters creativity.

However, a total absence of coding would involve an unworkably complex theory of perception (Maslow, 1954, p. 275), and he argues rather, that the conditions of creativity lie in the capacity to code stimuli on the basis of a wider range of aspects than merely the stereotyped elements which lead to conventional coding. Bandura and Walters(1963) too point out that the acquisition of 'patterns of behaviour' (1963, p. 51) involves the formation of 'adequate generalizations' (p. 9), although they emphasize that the process of generalization cannot occur without 'sharp discriminations' (p. 9), or what Maslow (1954, p. 261) calls 'idiosyncratic perception'. However, it is apparent that 'effective' (Bruner, 1962, p. 19) combinations of ideas are inhibited by discriminations which are excessively fine.

These authors all emphasize that the highly original individual would be expected to display a marked capacity for relating widely discrepant notions, or in Bruner's terms, to possess wide categories. Pribram (1964, pp. 107, 108) has further emphasized this point of view, stressing that original productions do not arise by chance, but that they represent an extension of the already known. This notion does away with the distinction between creative and conventional thinking, emphasizing rather, that the one arises out of the other. He argues that the 'work' involved in originality is concerned with extending the boundaries of the conventional, in showing that existing structures may be widened to include new notions. In fact, Pribram may be seen as further emphasizing the view that originality is closely tied up with the capacity to widen existing

categories, and to code into existing categories data which would conventionally be excluded.

A cognitive variable closely connected with category width is that of risk taking, although it is not completely clear whether broad categorization is related to high or low risk taking[3]. However, McClelland (1963, p. 184) has argued that willingness to take risks is an essential attribute of the original individual, and this suggestion has been further emphasized by Roe (1963, p. 170). On the basis of this point of view, it would be anticipated that highly original subjects, who display broad categories in linking apparently discrete domains of experience, would score highly on tests of category width, and also on tests of risk taking.

Whereas Bruner (1962, p. 17) argues that originality involves combinations of problem elements regulated by some internal, often

[3]Kogan and Wallach (1964) have argued that risk taking and category width interact with a perceptual variable, field dependence/independence (Witkin, 1962), so that broad categorization may be associated with either high or low risk taking, according to the individual's particular perceptual style. However, this interrelatedness of originality and perception is by no means a new notion confined to recent theorizing. James (1890, p. 360) suggested that the essence of originality lies in the capacity to make associations by similarity, rather that merely by contiguity. Hence, original thinking involves a particular kind of perception, in which the individual possesses a marked capacity for the recognition of 'identical points in the midst of different circumstances' (James, 1890, p. 347). He goes on to argue (1890, p. 361) that creative thinking is facilitated by perception in which little attention is paid to the details of particular forms, but rather the focus is on the ground. In this way, global associations, which transcend mere contiguity can be made, and the liklihood of original solutions is increased.

intuitive, criteria,[4] Watson (1930) emphasized the role of contiguity in linking stimulus and response, and in a similar way some theorists (Mach, 1898; Poincare, 1913; Thurstone, 1924; Campbell, 1960) stress the role of 'blind' chance in originality. Campbell (1960, p. 206) argues that all cognitive processes involve adaptive reorganization and that, at the most fundamental level, such reorganization is always achieved through blind variation and selective survival. Original thinking involves a 'breakout' (1960, p. 207), although it is necessarily a blind break out - otherwise original acts would be nothing more than particuarly wise anticipations based on the already known, and not original at all.

Campbell (1960, p. 220-221) accounts for consistent individual differences in originality by arguing that original individuals are marked by the accuracy and detail of their representations of the world, and by the number and range of their cognitive processes. Accordingly, the notoriously eccentric behaviour of highly creative individuals is seen as involving production of blind behaviour variants which lie outside 'normal' limits.

Although Bruner (1962, p. 25) argues that the term creativity necessarily implies a useful, effectively surprising end product, several theorists (Freud, 1910; Kris, 1950; Kubie, 1958; Gordon, 1961; Neisser, 1963) emphasize that the real nature of original behaviour is independent of the end product, lying in the dichotomy between orderly,

[4] Neisser (1963) has suggested that the similtaneous utilization of multiple criteria is the essential element of originality. Original thought 'asks all the questions at once' (1963, p.7). He suggests (1963, p.7) that original behaviour could be obtained from a computer if it could be programmed to test all criteria simultaneously rather than linearly.

regulated, rational behaviour on the one hand and disorderly "non-rational" on the other.

In emphasizing this point of view, Neisser (1963, p.8) suggests that there are two kinds of intellectual processes - 'main-stream' processes, and more peripheral activity. The main-stream processes are subject to the logic and order imposed by the external world, but the other kind of activity is less subject to such restrictions. It takes account of pre-conscious and fantasy material in processing environmental data, and may produce original solutions.

Like Neisser, Gordon (1961) emphasizes that in originality the non-rational and affective processes are dominant over the rational and intellectual. Arguing that both scientific and artistic creativity reflect the operation of the same fundamental processes, he emphasizes (1961, p. 48-53) the importance of irrational procedures in originality, and suggests, as an important element, the process of "wish-fulfilment" (Freud, 1900) which involves the ability to get away from the 'logical'.

Gordon (1961, p.9) stresses the importance of thorough knowledge of material, arguing that the 'moment of insight' described by Ghiselin (1955, p. 29, 30) can not occur as an isolated flash of inspiration, but that it arises out of familiarity with the field. This point of view has been further emphasized by Bruner (1962, p.22) and Pribram (1964, p. 107). Granted a sufficient knowledge of the pedestrian facts, originality is facilitated by the efficient use of the subconscious and the non-rational interplay of ideas which occurs there (Gordon, 1961, pp. 10-11), and the ability to tolerate the apparently irrelevant (1961, p. 29).

Gordon (1961, pp. 29-54) also emphasizes that a central concept in original behaviour is that of play. Einstein (Gordon, 1961, p. 41) has pointed out that combinatorial play is an essential feature of productive thought, and Gordon argues that there are at least three ways in which play can lead to original solutions. These involve play with the meanings and definitions of words, play in pushing a fundamental law or concept 'out of phase', and play with metaphors.

He cites (1961, pp. 124-126), as an example of play with words, an occasion on which a group of men seeking a radically new kind of can-opener spent three hours 'playing' with the word 'open', in an attempt to get a new insight into the essential nature of a can-opener. Discussing play which involves pushing a basic law out of phase, Gordon (1961, p. 127) refers to the development of Lobachevsky's system of non-Euclidean geometry. Euclidean geometry includes acceptances of the axiom that there can only be one straight line drawn through a given point parallel to another straight line in the same plane. However, starting from a new axiom which assumed that several such lines could be drawn, Lobachevsky developed a geometric system whose internal consistency is equally as good as that of conventional Euclidean geometry.

Finally, he suggests (1961, p. 30) that 'metaphorical play' is exemplified by statements like 'wiring a building should be like plumbing', or the suggestion (1961, p. 42) that an example of a perfect, non-drip ketchup bottle may be seen in the operation of a horse's anus.

The function of such play is to permit novel insights which get beyond the conventional limits by 'making the strange familiar' and 'making the familiar strange' (1961, p. 33), for the effect of logic

and conventionally rational ways of looking at the world is to inhibit original solutions.[5]

Like Neisser and Gordon, psychoanalytic theory, too, stresses the importance of fantasy and of non-rational processes in originality. Freud (1900) argues that there are two main kinds of processes regulating ideas - primary processes and secondary processes. Secondary processes subserve the purposes of the ego and are 'rational' and 'logical' within the particular individual's social context, but primary processes are free of the restraints of logic. Originally, the neonate makes use of primary processes alone in seeking fulfilment of libidinal drives, but gradually, as the processes of socialization goes on, increasing repression of id materials occurs.

The flow of ideas comes to be regulated by the 'rational' secondary processes which obey the rules of the culture concerning what ideational juxtapositions are possible, and 'irrational' ideas and unacceptable impulses are repressed. Having been repressed and consequently drawn into the unconscious, repressed thoughts are governed by the 'primary process' which is characterized (Freud, 1900) by 'absurdity' and 'incorrectness', and in this form they continue to influence behaviour.

Id drives, unsatisfied because libidinal impulses have been repressed, result in the build up of tension, and fantasy material

[5]In emphasizing the importance of play, Gordon may be compared with Brown (1959), who suggests that modern man is restricted in his psychic life by the loss of his capacity for 'polymorphously perverse' play (1959, p. 70), and that he is stylized and rigidified by the loss of this capacity.

rises from the id in an attempt to reduce this tension. Since ideas arising from the unconscious are governed by the primary processes, this fantasy material is marked by characteristics like condensation, as a result of which a single thought may include material from a number of fused ideas; compromise which is marked by reconciliation of several ideas by fusing them into a single idea intermediate to them all; the use of very loose connections between ideas (puns etc.); and toleration of apparent contradictions, so that any thoughts may coexist, regardless of how mutually exclusive they seem to be.

In the case of the unoriginal person (Freud, 1910), these fantasies are rejected from consciousness, but the original individual accepts them into consciousness, and his behaviour reflects the freedom from conventional ideational restraints which characterizes primary-process thought. A free intermingling of ideas normally kept discrete by the "logic" of secondary processes is possible, and out of this free fusion of ideas arises originality.

More recent psychoanalytic theorizing about originality places greater emphasis on the role of the preconscious. Kris (1950) argues that repressed impulses can be cathected with 'ego energy' and hence become part of the preconscious, in a process roughly the reverse of the classical Freudian concept of repression. From the preconscious, such materials are able to influence behaviour. Thus, Kris suggests that the ego may actively make use of libidinal impulses during the process of creativity, rather than merely failing to repress them, as Freud has suggested.

In the most recent psychoanalytic formulation, Kubie (1958) contends that all symbolic behaviour is carried out at the preconscious

level, and consists of the free shuffling of ideas into new juxta-positions. However, the effect of the ego is to rigidify and inhibit this shuffling. Consequently, in this conception, the determinant of originality is the extent to which the pre-conscious is free of ego control.

A further psychoanalytically oriented position is that of Pine (1959), who suggests that the difference between creative and non-creative individuals lies in the extent to which their imaginative creations contain undisguised expressions of drive. Although the drive expression of highly original individuals is not out of control, as is the case in the bizarre originality of the psychotic, the productions of creative individuals are marked by the absence of rigid drive repression, and by the comparatively direct expression of drives, within the limits imposed by social desirability.

Despite superficial differences, all these psychoanalytically oriented positions emphasize that the difference between original and unoriginal individuals lies in the extent to which impulses are subjected to repression and control; the non-creative person is characterized by control of 'undesirable internal impulses', whereas the original person displays lower levels of control.

Although psychoanalytic theory offers no suggestions as to the cognitive mechanisms through which the control of impulses is effected, Luria's (1959) theorizing concerning the role of speech in regulating behaviour suggest that impulse control may be achieved by the use of internal verbal rules.

Hence, cognitive functioning may be seen as involving the development and use of cognitive rules whose function is largely that

of regulating impulses. In this conception, originality involves the development and use of a certain kind of rules marked in particular by the capacity to express impulses, original behaviour reflecting the operation of those kinds of rules. Individuals whose behaviour is consistently mediated by impulse-expressing rules will display distinct personality traits which constitute a personality type marked by impulsivity, nonconformity and originality. A test of impulse expression, based on this point of view, was constructed for the purpose of this study (p. 43).

A number of studies (Crutchfield, 1955; Barron, 1955; Couch & Keniston, 1960, McGuire, 1961; Cattell, 1963; Eysenck, 1963a; 1963b) suggest that such a personality type does, in fact, exist. Crutchfield (1955) has demonstrated that people who are placed in a position where their own opinions appear to be sharply at odds with those of the group at large, tend to revise their opinions to conform to the concensus, even when fundamental issues like an individual's appraisal of himself are involved, (1955, p. 193). However, the extent to which group pressure modified behaviour differs markedly and reliably (1955, p. 194) from individual to individual. Thus, it is possible to define two contrasting personality types, the one characterized by high levels of conformity, the other by independence of judgment.

Crutchfield (1955, p. 194) has shown that conformity correlates with a number of other personality traits which give an indication of the nature of the conformer. Conformity correlates negatively with qualities like 'intellectual effectiveness', 'leadership', and 'social effectiveness', and positively with 'inferiority feelings', 'authoritarianism', and 'rigid

self-control'. Hence, Crutchfield (1955, p. 195) describes the highly conforming individual as a person who 'overcontrols impulses', and 'needlessly delays or denies gratification', while the independent individual is marked by 'freedom from compulsion about rules'. Hence, Crutchfield has invoked the concept of the rule as a major behaviour mediator and has suggested that the role of rules in mediating behaviour is a major dimension of personality.

McGuire too (1961, p. 5) includes the reaction to social pressure to conform among the interacting variables of which observed behaviour is a function, while a number of other studies cited by Messick and Ross (1961, pp. 91 - 170) indicate that social conformity is a distinct personality trait which can be measured by appropriate techniques.

Crutchfield (1955, p. 196) has linked conformity to originality by concluding that conformists, whom he characterizes by their low ability to tolerate their own impulses, possess less originality while independents, who resist social conformity pressures, retain the capacity to express their own impulses and are capable of higher levels of originality. The non-conforming position of the original individual has been further emphasized by Drevdahl and Cattell (1963), who pointed out that the 'creative' person, selected on the basis of artistic and literary works, tends to differ from the general population in 'undesirable' ways. He is notably lacking in conformity, concern for propriety, and adherence to social standards. Torrance (1962, pp. 118-124) has gone so far as to suggest that one of the original individual's major problems is the maintenance of divergent patterns of thinking in the face of pressure to conform.

The present author has argued that original behaviour is best represented in terms of cognitive mediational units, and has suggested that the cognitive rule may well be the most efficient mediational unit to invoke in attempting to represent behaviour of the levels of complexity involved in originality. Certain modes of data-processing are consistently reinforced by society, so that conforming to these modes reduces the 'cognitive strain' (Bruner, 1963, p. 134) associated with life. Hence, non-original behaviour is seen as mediated by cognitive rules which closely reflect the preferences of the particular culture, whereas highly original individuals display low levels of regard for the rules of the culture.

The personality organizations underlying the tendency to conform or not conform have been related by Freud (1908) to the prototypical situation in which the child first finds his own impulses in conflict with the demands of others, and encounters strong pressure toward control of internal impulses. This conflict centres around the control of elimination. When pressure is brought to bear on the child during toilet training, he is being taught to control impulses in keeping with the dictates of the external world. In fact, he is learning a rule about how to treat impulses, a rule which later mediates conforming behaviour.

Two outcomes of this pressure are possible. The child may internalize parental injunctions, thus acquiring the ability to control his own impulses in a socially approved way - such an individual 'learns the rules' at the expense of impulse suppression. On the other hand, the child may fail to internalize external edicts, thus failing to 'learn the rules'. Such a child is able to express internal impulses

which would be suppressed in the other, but his behaviour is non-conformist and unconventional. It is also possible to conceive of a third alternative. A child might actively reject external injunctions rather than merely fail to learn the rules, establishing rules of his own, rules of impulse expression. In this way, originality can be regarded as not merely a failure to learn behavioural control, but as an active kind of behaviour in which rules of originality are applied, instead of rules of impulse suppression.

In the Freudian terminology, highly controlled individuals are referred to as anal retentives or suppressives, while those who do not suppress impulses are termed anal expulsives or anal expressives.

Couch and Keniston (1960) have described a response syndrome related to anal expulsiveness/retentiveness. They reported a consistent tendency for some individuals to choose positive answers to questionnaire scales, while others consistently chose negative answers. Labelling the positive responders 'Yeasayers', they pointed out that 'yeasaying' is characterized by desire for novelty, high levels of responsiveness to stimuli, originality of response-style, and low levels of impulse control, while the opposite personality type involves stereotopy of opinion, suspicion of novelty, low levels of responsiveness to stimuli, and high levels of impulse control. Couch and Keniston summarized the two opposing types as involving expression of undesirable impulses on the one hand, and control of undesirable impulses on the other (1960, p. 168). Thus they relate agreeing response set to impulse expression and originality.

Barron (1955, p. 481) has concluded that there is a certain kind of attitude to experience which involves independence of judgement and refusal to be swayed by strong conformity pressures from the peer group, and he has demonstrated (1953a) that this attitude is related to

self-ratings of originality. Individual subjects were made members of prearranged groups whose 'stooge' members endorsed some false opinion and then brought pressure on the subject to concur in the opinion. Subjects who refused to yield were shown to rate themselves as artistic and original (1953a), and to express a preference for complex and asymmetrical line drawings. In other studies (1952; 1953b) Barron showed that this preference is significantly correlated with choice of art as a vocation (1952) and with rated originality in graduate studies (1953b).

Barron concluded (1955, p. 482) that certain individuals, who are consistently disposed towards the production of unusual adaptive responses are characterized by strong resistance to social pressure to conform, and by preference for the greatest possible richness of experience, even though disorder results.

Furthermore, just as Couch and Keniston related differences between Yeasayers and Naysayers to impulse expression, Barron (1955, p. 485) showed that Air Force officers rated as highly original on the basis of a battery of 8 tests of originality, differed significantly from unoriginal subjects in that derivatives of the anal expulsive stage in psychosexual development predominated in their libidinal organization, and he concluded that this reflected significantly less repression of socially unacceptable impulses in the highly original group.

Finally, Barron (1955, p. 485) concluded that the disposition to originality represents a complex mode of responding to the environment, intimately related to personality organizations involving traits like rebelliousness, disorderliness and independence of judgment, traits

which characterize the anal expulsive individual and, in terms of the present author's working position, can be seen as reflecting a characteristic set of mediating rules.

Couch & Keniston and Barron have shown that originality is related to impulse expression and resistance to social pressures towards conformity, and their findings suggest that the two personality traits are interrelated. This relatedness has been further emphasized by Eysenck who suggested (1957; 1963a; 1963b) the existence of a broader concept which subsumes both traits - the concept of impulsive extraversion. He has postulated (1957) that the variance of human personality is best accounted for in terms of a number of orthogonal dimensions which include the dimension of extraversion/introversion, describing the extravert (1963a, p. 52) as an individual who is sociable, needs other people, craves excitement, takes chances, and acts on the spur of the moment, whereas the introvert is quiet, introspective, looks before he leaps, and distrusts impulses.

Eysenck (1963b) p. 51) has further postulated that there are two kinds of extraversion, distinguishable in terms of the concept of impulsivity/sociability. The impulsive individual is marked by absence of the tendency to think things over before acting, and the tendency to act on impulse, while the sociable individual tends to be more influenced by social desirability. Hence, it can be seen that the kind of individual referred to in this thesis as 'original' resembles, in many respects, those persons whom Eysenck labels 'impulsive extraverts'.

The present author is suggesting that complex behaviour is appropriately represented in terms of mediational events, and has

concluded that the concept of the cognitive rule constitutes an economical unit of mediation. In this conception, originality is seen as involving behaviour mediated by unconventional rules. Moreover, the authors cited in this section (Crutchfield; McGuire;Barron; Couch & Keniston; Eysenck) have all described personality types characterized by absence of concern for conventional rules of behaviour. Consequently, it is argued that highly original individuals will tend to display the personality traits described by these authors.

While admitting that there is disagreement concerning the factorial structure of originality and the best way it can be represented, the present author has assumed the following working positions, the first of which is testable, the second 'allowable' in the physicist's sense of the term (Burt, 1958, p. 50).

1. Some behaviour may be economically represented by postulating the existence of a factor of 'originality', overlapping to some extent, with general intelligence.

2. Complex, original responses are best accounted for in terms of mediational events, perhaps both of an r_m - s_m and of a cognitive sort, although the relevance of each of the ways of representing specific behaviour will have to be worked out in the future.

Furthermore, it is argued that original behaviour, represented in cognitive ways, reflects the operation of consistent and characteristic patterns of events, which result in a typical kind of personality associated with the disposition to originality.

CHAPTER III

DEFINITIONS, ASSUMPTIONS, AND HYPOTHESES

I DEFINITIONS

The following definitions have been adopted in the present study:-

Originality The capacity to invent and innovate, rather than merely to reproduce the already known. Originality is defined, for the purposes of this thesis, as the disposition to produce adaptive and rational test responses which are statistically uncommon, by comparison with the responses of other members of the reference group. Original responses are, therefore, defined by the particular experimental group employed, and may or may not be original in some other context.

Intelligence Intellectual ability or mental power, which is the product of interaction between genetic endowment and experience. It is not directly measurable, but is inferred from the results of tests which conventionally measure the capacity to reproduce the already learned, rather than the capacity to invent new responses.

Personality A cluster of interrelated traits, largely acquired through training, which mediate consistent syndromes of behaviour.

II ASSUMPTIONS

Implicit in the present author's working assumption that some behaviour may economically be represented by postulating the existence of a factor of originality, overlapping to some extent with conventional IQ, are two assumptions about the data of this study.

Assumption 1 - Correlations between the various tests of originality and the tests of intelligence will differ significantly from zero.

Assumption 2 - Factor analysis of the matrix of intercorrelations among the battery of tests employed in this study will yield at least one factor defined by the measures of originality.

III HYPOTHESES

Hypothesis I - On the basis of the relevant theory, it is hypothesized that highly original members of the sample employed in this study will be distinguished from those scoring low, on measures other than the tests of originality.

Psychoanalytic theorists, in particular, (Freud, 1910; Kris, 1950; Kubie, 1958; Pine, 1959) have stressed the relationship between impulse expression and originality, and other writers (Barron, 1955; Couch & Keniston, 1960) have further emphasized this point, while Lauie (1959) has suggested a mechanism through which impulse expression may be regulated. Crutchfield (1955) and Cattell (1963), on the other hand, have stressed the role of non-conformity in original behaviour, while a number of writers (Maslow, 1954; Bruner, 1963; Pribram, 1964) have argued that a critical determinant of originality is the extent to which individuals are able to extend the boundaries of what is known to go with what.

Hence, the following specific hypotheses will be tested.

1. Highly original subjects will score significantly higher than low originals on the following tests:
   (i) Impulse Expression (p. 43)
   (ii) Anality (Couch and Keniston, 1960)
   (iii) MPI Extraversion (Furneaux and Gibson, 1961)
   (iv) MPI Neuroticism (Furneaux and Gibson, 1961)
   (v) Category Width (Pettigrew, 1958)
   (vi) Risk Taking (Brim, 1957)
2. Highly original subjects will score significantly lower than low originals on the following tests:
   (i) Stable Introversion (Anderson, 1964)
   (ii) Conformity (Crutchfield, 1955)

Hypothesis II - It is further hypothesized that it will be possible to discriminate significantly between high and low originals on the basis of the optimum combination of a battery of non-intellective tests. Such significant discriminations would indicate that highly original and highly unoriginal individuals differ along dimensions other than their scores on originality tests.

CHAPTER IV

EXPERIMENTAL DESIGN

I THE SAMPLE

The sample was obtained by arranging for the entire Grade Seven population of a large Edmonton Junior High School to return to school in June, for one additional day, in order to take a battery of tests which the children believed might have some bearing on their 1964-65 class placement. Of 354 children enrolled, 345 attended on the required day, and of this group, 320 completed the entire test battery. These 320 children constituted the sample employed in the present study.

The full sample, whose mean age was 13 years 6 months with a SD of 16.9 months, (range - 11 years 1 month to 16 years 1 month), had a mean verbal IQ on the appropriate Lorge-Thorndike test of 114.3 (range - 79 to 150; SD = 14.5). The sample included 170 boys, for whom the mean verbal IQ was 114.7 (range - 79 to 148; SD = 15.2), while the corresponding figure for the 150 girls was 113.8 (range - 88 to 150; SD = 13.6). The mean age of the boys was 13 years, 10 months, (SD = 16.6 months; range - 11 years 1 month to 16 years 1 month), and of the girls 13 years 2 months (SD = 17.3 months; range - 11 years 7 months to 16 years 1 month).

II THE TESTS

Tests employed in the study fell into three groups - tests of originality, conventional tests of 'convergent thinking', and non-intellective tests (mainly personality measures).

Tests of Originality

The most elaborate battery of creativity tests developed to date is that of Guilford (1950; 1960). Working within the framework of his own model of intellect (1959), Guilford has argued that the thinking abilities involved in creativity include divergent productions, transformations, sensitivity to problems, and redefinition. On the basis of this point of view, he includes the following factors and related tests among those important in assessing creativity.

Factor	Test
Sensitivity to Problems	Seeing Problems - subjects must list problems that might arise in connection with some common object.
Semantic Flexibility	Uses - subjects are required to write a variety of uses for a brick.
Associational Fluency	Associations IV - subjects must produce a word that can be associated with a given word.
Originality	Symbol Production - subjects produce symbols to represent activities and objects.
	Consequences - subjects list unusual consequences of certain events.
Figural Redefinition	Concealed Figures - subjects indicate which of four complex geometrical figures contains a given figure.

Although his approach to the testing of creativity is within the framework developed by Guilford, Torrance (1962; 1963) has slightly modified some Guilford measures in order to make them suitable for use at all age levels. Thus, he has employed a slightly modified version of the Uses test, substituting a tin can for a brick, since a tin can is

more familiar to young children (1962, p. 44). In addition, (1962, p.46) Torrance has developed a number of non-verbal tests, among which is the Circles test, in which subjects are confronted with a page of 35 circles and instructed to sketch as many unusual objects as they can, which have the circle as an integral part.

The present study sought to measure both verbal and non-verbal aspects of originality, and consequently, the following six Guilford/ Torrance type creativity tests were administered.

Verbal - Seeing Problems; Tin Can Uses; Consequences.

Non-verbal - Symbol Production; Concealed Figures; Circles.

Tests of Conventional Convergent Thinking

Scores were obtained on six measures of convergent thinking. These tests included:

1. Verbal IQ - obtained by administering the Lorge Thorndike, level 4, Form A.
2. Non-verbal IQ - the test administered was the appropriate form of the Lorge Thorndike, level 4, Form A.
3. School Achievement - the academic average of each child for core courses only was recorded.
4. Word Knowledge - children were required to select which alternative was the best synonym for a given word (Vocabulary; French, 1963).
5. Convergent Verbal Reasoning - given a paragraph to read, subjects had to indicate which of four alternative conclusions offered was the only possible correct conclusion which could be drawn on the basis of the information supplied in the paragraph (Inferences; French, 1963).

6. Length Estimation - subjects were required to indicate which of three alternative paths from one point to another were the shortest (French, 1963).
7. A socio-economic status (SES) score was also obtained (MacArthur and Elley, 1963).

Non-Intellective Tests

The relevant theory suggests that the disposition to originality is related to certain personality traits, including non-conformity, impulse expression and impulsive extraversion.

Accordingly, the following tests were employed in the study:

1. Conformity - subjects indicated their agreement or disagreement with 20 points of view on which there is a clear-cut conventional position.

e.g. It is all right to get around the law, if you don't actually break it. T N

An individual's score consists of the number of conforming opinions he expresses (Crutchfield, 1955).

2. Stable Introversion - subjects indicate what kind of person they are, by expressing the degree to which their behaviour resembles that described in each item of the scale.

e.g. Sits calmly to watch a football or ice hockey match on TV. A F O S N

An individual's score is obtained by weighting responses from 0 to 4 so that high scores reflect stable introversion, and totalling item scores (Anderson, 1964).

3. Anality - subjects indicate the extent to which they agree or disagree with a number of statements which reflect anal tendencies.

e.g. Nothing is worse than an offensive odour.

Strongly Agree	Agree	Slightly Agree	Slightly Disagree	Disagree	Strongly Disagree

Responses are weighted from 0 to 5, and subjects' scores are obtained by summing points for each item (Couch & Keniston, 1960).

4. Impulse Expression - On the basis of Luria's (1959) theorizing about the role of speech in regulating behaviour, a test of impulse expression was constructed, in which subjects were required to indicate which of several alternative statements they would be most likely to make to themselves in a number of situations, described in the test. In each item they found a strong impulse at odds with obviously 'right' things to do. It was argued that the number of permissive statements chosen would inversely reflect the extent to which subjects controlled their own impulses through the use of internal verbal rules.

e.g. A friend asks you over to hear some new records after school, and you want to go. Which would you be most likely to say to yourself?

(1) I must make sure that I'm not late home.

(2) I must do my homework before I go.

(3) My mother is expecting me to come straight home from school.

(4) I'll go along and have a good time. I can worry later.

5. Category Width - given an estimate of the central tendency of some group on some measure, subjects are required to estimate the extreme scores which might occur in this group on the particular measure.

   e.g. Most birds fly at the speed of about 17 miles per hour. How fast does the fastest bird fly?

   1. 30 miles per hour
   2. 21 miles per hour
   3. 60 miles per hour
   4. 18 miles per hour

Responses are scored from 0 to 3, according to the extent to which they deviate from the given value, regardless of the true figure, with the responses furthest from the given figure receiving the highest score (Pettigrew, 1958).

6. Risk Taking - subjects indicate the probability with which they believe certain occurrences may happen, and also the degree of confidence with which they make the judgment.

   e.g. The chances that an adult Canadian male will make at least $4,000 a year are about .... in 100.

Very sure	Quite sure	Moderately sure	Slightly sure	Not sure at all

Scores are obtained by multiplying the % estimated by the degree of confidence, to which numerical values from 4 to 0 have been assigned (Brim, 1957).

7. The scores were also obtained on the 4 scales of the Myers-Briggs Type Indicator (Myers, 1962). This scale (the MBTI) is based on Jung's (1923) theory of type, and holds that

apparently random variation in human behaviour is really quite lawful and consistent, resulting from consistent differences in the way in which different individuals perceive the world. The rationale underlying the scale argues (Myers, 1962, p. 1) that an individual's personality is structured in terms of 4 basic dimensions.

(i) Extraversion-Introversion - the extravert (Myers, 1962, pp. 1-2) focusses upon people and things, rather than concepts and ideas.
(ii) Thinking-Feeling - the thinker discriminates impartially between true and false, while the feeler discriminates between the valued and the not valued.
(iii) Sensing-Intuiting - the senser becomes aware of things directly through the operation of the 5 senses, whereas the intuiter becomes aware through the associations which are attached to perceived stimuli.
(iv) Judging-Perceiving - the judgmental person relies mainly on thinking and feeling processes, while the perceptual person relies mainly on sensing and intuiting.

MacKinnon (1961) has shown that highly creative individuals differ from the general population in their scores on the MBTI, demonstrating the existence of significant relationships between the rated creativity of architects and their scores on the intuition dimension of the scale. The preference for the intuitive mode of perception increased significantly as the rated creativity rose. Furthermore, the entire creative group were intuiters, whereas the proportion of intuiters in the general population is only about 25%. Accordingly the MBTI was administered to the present sample, and their scores calculated on the dimensions of extraversion/introversion (E-I), sensing/intuiting (S-N), thinking/feeling (T-F), and judgment/perception (J-P).

8. Maudsley Personality Inventory - finally, scores were obtained on the neuroticism and extraversion scales of the children's version of the Maudsley Personality Inventory (MPI) (Furneaux & Gibson, 1961).

III PROCEDURE

Test Administration

All 320 members of the sample were tested on the same day, in the same room. The children assembled in the school gymnasium and wrote the tests between 9 a.m. and 4 p.m. Subsequent scoring of protocols was carried out according to the published specifications in the main, except in the case of the tests of originality, which were scored according to the following procedure.

Scoring of Originality Tests

A serious difficulty which arises when so-called tests of creativity are employed is concerned with validating the measures obtained. Vernon (1964, p. 168) has emphasized this difficulty pointing out that only long-term studies analagous to Terman's (1947) studies of intelligence can really support claims concerning the capacity of 'creativity' tests to predict creative productivity. Furthermore, just what is 'creative' is subject to social judgments (Dentler & Mackler, 1964, p. 2). On the other hand, the concept of originality operationalizes the notion of creativity, permitting the obtaining of valid measures through the use of a statistical approach, in which any response which is both task appropriate and uncommon within the particular reference group under study is said to be original.

In this respect, Torrance (1962, p. 72) has pointed out that Guilford-type creativity tests may be scored in several ways, including scores for fluency, flexibility and originality. For the purposes of this study, then, it was decided to score the creativity tests for originality only, wherever this was possible. This approach involves allotting weights (Torrance, 1963, p. 72) to the responses to each item of each test, the highest weights going to the least common responses. Accordingly, Consequences, Seeing Problems, Uses and Circles were scored in this way, using the following weights: responses appearing on more than 15% of protocols - 0; responses appearing between 7% and 15% - 1; responses appearing from 3% to 6% - 2; responses appearing 1% or 2% of the time - 3; responses appearing less than 1% - 4.

In all cases, it was necessary for a response to be task appropriate for it to score any points at all. This procedure weights adaptive, statistically uncommon responses, which are, by definition (p. 36) original. Scoring for originality rather than creativity also increases the reliability of the measures employed. Mackler, (1962) showed that although the reliability of Tin Can Uses was very low when the test was scored for creativity, the figure rose to .66 when scoring was for originality.

In order to make scores on the various originality measures directly additive, despite their markedly different means and variances, all scores were transformed into stanine scores (McGuire, 1961). By summing stanine scores on the six originality tests, it was then possible to obtain a full-scale originality score for each individual in the sample. The mean full-scale originality score for the entire

sample was 30.0, with a standard deviation of 6.86.

On the basis of these full-scale originality scores, three sub-samples were then defined. The first sub-sample consisted of the 32 individuals out of the entire sample who had the highest full-scale originality scores. Thus, this group (the high originals), consisting of 20 boys and 12 girls, whose mean full-scale originality score was 42.4 (SD = 2.85), represented the top 10% of the entire sample, as far as originality was concerned. There was no relationship between membership in this group and sex ($X^2 = 1.26$, df = 1).

A second sub-sample was selected in a similar way, except that it consisted of the lowest 32 scorers on full-scale originality, and consequently represented the bottom 10% of the sample in terms of originality. The mean full-scale originality score of 18.1 (SD = 3.06) obtained by the 16 boys and 16 girls comprising this group (the low originals) was significantly different from the high originals' mean ($t = 32.8$, $p < .01$) while membership in the group was independent of sex ($X^2 = 0.14$, df = 1).

However, since the mean verbal IQ of the low originals (mean = 101.8, SD = 12.5) was significantly different from the figure (mean = 122.2, SD = 11.01) for the high originals ($t = 6.92$, $p < .001$), a further sub-sample was defined, in an attempt to limit the effect of confounding verbal IQ and originality. This group (the low original/average IQs) consisted of all subjects who had verbal IQs of at least 100, and full-scale originality scores of 25 or less. The mean verbal IQ of the low original/average IQs was 112.8 (SD = 8.64), and this figure does not differ significantly from the full sample mean IQ

(t= 0.91). In view of the lack of homogeneity of variance displayed by the data (F_{max} = 2.82, $p < .01$), this difference was tested using Cochran and Cox's correction (Ferguson, 1959, p. 143). However, despite the fact that this group did not differ from the full sample, as far as IQ is concerned, its mean IQ was still significantly different from that of the high originals (t = 3.94, $p < .001$). The 17 boys and 22 girls comprising the low originality/average IQ group had a mean full-scale originality score of 21.3 (SD = 3.33), while again, there was no relationship between sex and membership in this group (X^2 = 1.61, df = 1).

Hence, analyses were carried out on data yielded by four experimental groups in all - the full sample, the high originals, the low originals, and the low original/average IQs.

IV STATISTICAL ANALYSIS

Correlations between Originality and Intelligence

Correlations were calculated between the two IQ measures obtained, and the various tests of originality, and the resulting correlation coefficients tested for significance, using the formula suggested by Ferguson (1959, p. 152).

Factor Analysis

The dimensionality of originality was investigated through the use of factor analysis. The rationale underlying factor analysis is based on the assumption that intercorrelations between a number of tests of apparently separate quantities reflect the existence of some common variable which all the tests are measuring, to some extent. None of these tests need be a pure measure in itself of the dimension,

which may have no real existence, except as a hypothetical construct. Such underlying dimensions, whose presence is indicated by the commonality between apparently differing tests, are referred to as factors. Thus, factor analysis permits consideration of a battery of tests in terms of a lesser number of dimensions (factors) whose magnitude and identity are a function of the particular configuration of common variance between tests. Accordingly, a factor may be summarized as a hypothetical variable common to several tests, while factor loadings are quantities which express the extent to which each individual test in a battery measures the particular factor under consideration.

The matrices of intercorrelations between tests obtained from the full sample, from the girls only, and from the boys only were subjected to Principal Axis factor analysis, using unities in the diagonal cells of the matrices. The computations involved were carried out on the University of Alberta's IBM 7040 computer system, using the Householder (1938) method of analysis.

The varimax factor rotation. These factors which had an eigenvalue greater than one were regarded as significant, since they contributed more variance than did a single test (Kaiser, 1960). In order to facilitate interpretation of those factors, analytical rotations were carried out, using Kaiser's (1958) normal varimax technique, which yields rotated factor matrices approximating simple structure (Thurstone, 1947). Although this procedure destroys the uniqueness of the Principal Axis solution, parsimony and ease of interpretation are more basic principles than mathematical purity (Harman, 1960).

Discriminant Function Analysis

Preliminary attempts to demonstrate the relationship between originality and a number of non-intellective variables involved univariate F-tests of high and low originality group mean-differences. However, although comparison of groups, one test at a time, provides a useful indication of the relationship between group central tendencies, discrimination between groups may be more effectively made by the use of a technique which simultaneously utilizes the discriminating power of several tests, combined in the optimum way. An appropriate technique, which permits maximum possible discrimination between groups, is discriminant function analysis, in which a new composite variable is defined on the basis of the best possible linear combination of a battery of tests. The significance of group differences on the new discriminant function may then be tested (Cooley & Lohnes, 1962, pp. 116 - 118).

The rationale underlying discriminant functions may best be illustrated by considering an example involving two groups, A and B, for whom scores have been obtained on two tests, X and Y. If the scores of the members of each group are plotted as bivariate points in a two dimensional space with X and Y as reference axes, the cluster of scores of each group will form a cloud of points. Within these clouds, ellipses may be formed by enclosing some given proportion of the total distribution, say 90%. As can be seen in Figure 2, ellipses of equal proportion of the two groups will intersect, and their points of intersection define a straight line, II.

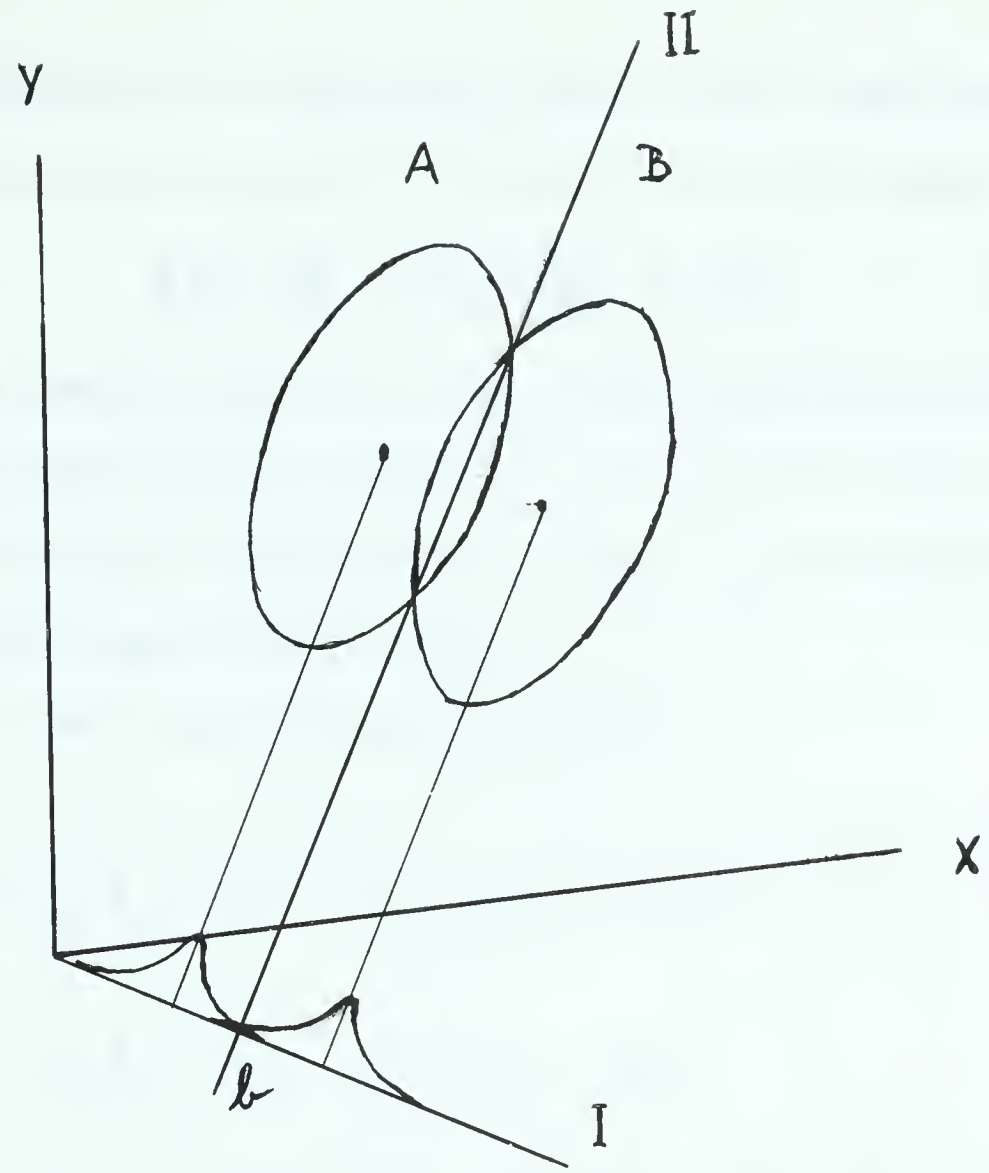

Figure 2. A diagrammatic representation of the geometry of discriminant function analysis.[a]

[a]Cooley & Lohnes (1962, p. 115)

If a second straight line I is drawn perpendicular to II as shown in Figure 2, and the points in the two-dimensional space are projected onto I, the overlap between the two one-dimensional arrays thus obtained will be at a minimum, being smaller than for any other possible line. Thus, discriminant methods transform scores on a number of variables to a single discriminant score, which is represented, for any individual, by his position on the line I. The point b divides this one-dimensional space into two regions, one representing probable membership in group A and the other probable membership in group B, and the overlap between these two regions is at a minimum.

Albebraically, discriminant functions are represented by the latent vectors associated with the latent roots of the equation

$$(W^{-1}A - \lambda_i I)\nu_i = 0$$

where I is an identity matrix, W is the pooled within-groups deviation-scores cross-products matrix, and A = T - W. T is the total sample deviation-score cross-products matrix. Thus, A is the between-groups deviation-scores cross-products matrix.

T, W and A are obtained as follows:

$$T_{jm} = \sum_k \sum_i (X_{jki} - \bar{X}_{j..})(X_{mki} - \bar{X}_{m..})$$

$$W_{jm} = \sum_k \sum_i (X_{jki} - \bar{X}_{jk})(X_{mki} - \bar{X}_{mk})$$

$$A_{jm} = T - W = \sum_{k=1}^{g} N_g (\bar{X}_{jk} - \bar{X}_{j.})(\bar{X}_{mk} - \bar{X}_{m.})$$

i designates people
j and m designate tests
k designates groups

What is required is that the between groups cross products is maximally large relative to the within groups cross products, i.e. that $\frac{v_i' A v_i}{v_i' W v_i}$ be at a maximum. Setting $\lambda_i = \frac{v_i' A v_i}{v_i' W v_i}$ the maximum value of λ_i is required. This may be obtained from the partial derivatives of λ_i and yields the derivative $(W^{-1}A - \lambda_i I)$, which has a maximum value when $(W^{-1}A - \lambda_i I)$ is equal to 0. It is a sufficient condition for a matrix expression to be equal to 0 if its determinant is 0. Thus, the

required value of λ_i is obtained when

$$\left| W^{-1}A - \lambda_i I \right| = 0$$

Having calculated λ_i, the associated vector v_i, with which λ_i is uniquely associated, gives the weights which must be applied to the tests in order to produce the maximum separation between groups. The number of possible sets of weights is a function of the number of groups and tests, and is equal to r, where r is the smaller of m the number of tests, or (g - 1), where g is the number of groups.

An F test of the goodness of separation is available (Rao, 1952, pp. 370-378), and is calculated on the basis of Wilk's lambda which is found from the expression

$$\Lambda = \prod_{i=1}^{r} \left[\frac{1}{1 + \lambda_i} \right]$$

F is derived from the expression

$$F = \frac{1 - \Lambda^{1/s}}{\Lambda^{1/s}} \quad \text{where} \quad s = \left[\frac{p^2q^2 - 4}{p^2q^2 - 5} \right]^{\frac{1}{2}}$$

$$df = \frac{pq}{\left[(N - 1) - \left(\frac{p + q}{2}\right)\right] s + 2\left[-(pq - 2)/4\right]}$$

In these expressions, p = number of measures, q = number of groups -1 and N = total number of observations.

An F significant at, say, the .05 level would indicate that the chance of obtaining such good separation of groups purely by chance is less than 5 in 100.

CHAPTER V

RESULTS

The results obtained in this study were arranged and reported in tabular form. (Raw scores on which they are based are shown in Appendix A). They may be considered as falling into three categories.

1. Findings concerning the relationship between originality and intelligence.
2. Findings concerning the dimensionality of originality.
3. Findings connected with the relationship between originality and personality.

Originality and Intelligence

Intercorrelations between the six originality tests and the conventional, 'convergent thinking' tests are shown in Tables I, II, and III. Table I contains the data for the full sample (with 318 degrees of freedom, critical value of the correlation coefficient for significance at the .05 level is .109), Table II the data for girls only (with 148 df, the critical value is .159), and Table III the data for boys only (with 168 df. the critical value is .149). It can be seen that most of the correlations obtained were significant at or beyond the .05 level of confidence - in the case of the full sample data, 58 of 66 correlation coefficients were significant, while the corresponding figures for the girls and boys were 50 and 47 respectively.

If 'convergent thinking' and 'divergent thinking' skills were completely independent, coefficients in the upper right-hand

TABLE 1

CORRELATIONS BETWEEN CONVENTIONAL TESTS AND ORIGINALITY TESTS

(N = 320)

	1	2	3	4	5	6	7	8	9	10	11	12
1. Verbal IQ	1.00	608[a]	771	671	399	197	362	194	352	145	268	263
2. Perf. IQ		1.0	615	472	292	222	303	231	350	171	302	364
3. Academic Ave.			1.0	651	442	250	402	163	430	185	345	299
4. Vocabulary				1.0	409	132	209	135	263	068	302	228
5. Inferences					1.0	252	029	038	199	105	156	138
6. Shortest Road						1.0	114	068	128	139	185	132
7. Seeing Problems							1.0	162	408	188	273	105
8. Tin Can Uses								1.0	257	220	168	065
9. Consequences									1.0	297	356	156
10. Circles										1.0	258	012
11. Symbol Production											1.0	195
12. Hidden Figures												1.0

[a] All decimal points have been omitted except in the diagonal

TABLE II

CORRELATIONS BETWEEN CONVENTIONAL TESTS AND ORIGINALITY TESTS FOR GIRLS

(N = 150)

		1	2	3	4	5	6	7	8	9	10	11	12
1.	Verbal IQ	1.00	640[a]	770	646	378	136	406	264	365	064	253	342
2.	Perf. IQ		1.0	632	533	339	198	290	281	312	133	253	381
3.	Academic Ave.			1.0	667	438	211	430	237	454	151	311	329
4.	Vocabulary				1.0	472	103	200	239	306	087	320	296
5.	Inferences					1.0	218	054	239	259	130	251	209
6.	Shortest Road						1.0	080	080	088	167	151	228
7.	Seeing Problems							1.0	241	421	222	284	130
8.	Tin Can Uses								1.0	346	277	196	086
9.	Consequences									1.0	348	366	216
10.	Circles										1.0	236	013
11.	Symbol Production											1.0	236
12.	Hidden Figures												1.0

[a] all decimal points have been omitted, except in the diagonal

TABLE III

CORRELATIONS BETWEEN CONVENTIONAL TESTS AND ORIGINALITY TESTS FOR BOYS

(N = 170)

	1	2	3	4	5	6	7	8	9	10	11	12
1. Verbal IQ	1.00	562[a]	777	705	427	267	306	103	333	259	288	159
2. Perf. IQ		1.0	593	397	243	262	323	174	405	247	369	339
3. Academic Ave.			1.0	635	452	304	367	086	399	251	385	259
4. Vocabulary				1.0	344	157	224	014	213	033	281	149
5. Inferences					1.0	280	004	003	138	067	066	065
6. Shortest Road						1.0	164	031	181	188	211	093
7. Seeing Problems							1.0	079	392	162	267	070
8. Tin Can Uses								1.0	160	111	133	053
9. Consequences									1.0	245	350	077
10. Circles										1.0	284	032
11. Symbol Production											1.0	156
12. Hidden Figures												1.0

[a] all decimal points have been omitted.

sub-matrices of the correlation matrices would all be zeros, with clusters of correlations in the upper left and lower right-hand sub-matrices reflecting the degree of intercorrelation among conventional measures, and among originality measures, respectively. Consequently, an estimate of the extent to which originality and intelligence are correlated lies in the extent to which the coefficients in the upper right-hand sub-matrices depart from zero. In all three sets of data, it can be seen that this departure is of considerable magnitude, and in fact, many of the coefficients in the off-diagonal sub-matrices exceed correlations in the within battery sub-matrices, often by considerable amounts.

Correlations between verbal IQ and the six originality measures ranged from .064 to .406, with a median correlation of .266, while correlations between non-verbal IQ and originality ranged from .133 to .405 (median. 302). Every full-sample correlation between originality and verbal IQ was significantly different from zero, while only Circles, in the case of the girls, and Tin Can Uses, in the case of the boys, failed to correlate significantly with conventional intelligence.

These figures are supportive of Assumption 1, and strongly suggest that originality and IQ are significantly related. Furthermore, although originality tests did tend to cluster together, intercorrelations among these tests were no larger, overall, than correlations between the 'convergent thinking' tests and the originality tests. This suggests that, although there may be a separate dimension of intellect defined by the originality measures, its contribution to the total variance of those tests is no more substantial than the contribution made by conventional intelligence.

Factor Analyses

Factor analyses were carried out on the intercorrelation matrices yielded by the scores of the full sample, of the girls only, and of the boys only.

The intercorrelations between test scores of the full sample are shown in TableIV, while Tables V and VI show the unrotated and rotated factor matrices, respectively. After rotation, the first factor was identified as a verbal intelligence factor, defined by the high loadings of Verbal IQ (.84), Academic Average (.835), Vocabulary (.807), Non-Verbal IQ (.605), Associations (.548), and Inferences (.524). The verbal intelligence factor accounted for 26.2% of the rotated common variance. The second factor was defined by Consequences (.647), Circles (.638), Seeing Problems (.624), Tin Can Uses (.532), and Symbol Production (.524). No other loading reached even .300, and it was concluded that this factor could appropriately be labelled a factor of originality, accounting, as it did, for 58% of the common variance of the six originality tests, and deriving 86% of its accountable variance from them. Of the remaining tests in the battery, Non-Verbal IQ, Academic Average, and Verbal IQ had the next highest loadings, further emphasizing the relationship between IQ and originality. The originality factor accounted for 7.66% of the total rotated variance and 14.0% of the common rotated variance.

The next factor in magnitude after the originality factor loaded most highly on MBTI J-P (.666), Impulse Expression (.584), MBTI S-N (.534), Neuroticism (.514), Stable Introversion (-.475), and Conformity (-.432). Students who scored high on this factor would be

TABLE IV

FULL SAMPLE CORRELATION MATRIX

(N = 320)

Var.	1 Verbal IQ	2 Peform. IQ	3 Ac. Average	4 Vocab.	5 Inferences	6 Short Road	7 See. Probs.	8 Tin Cans	9 Consequences	10 Circles	11 Symb. Prod.	12 Hid. Fig.	13 Assns.	14 Imp. Express	15 Conformity	16 Cat. Width	17 Risk Taking	18 Stab. Intr.	19 MPI Extrav.	20 MPI Neurot.	21 Anality	22 MBTI E-I	23 MBTI S-N	24 MBTI T-F	25 MBTI J-P	26 SES	27 Sex
1	1.00	608[a]	771	671	399	197	362	194	351	145	268	263	394	058	093	191	163	-126	-066	-018	034	-037	177	021	091	271	029
2		1.0	615	472	292	222	303	231	350	171	302	364	281	014	034	108	093	-053	-095	-073	035	-088	125	-054	041	260	-015
3			1.0	651	442	250	402	163	430	185	345	299	398	053	160	151	152	-079	-084	-068	082	-069	123	-018	136	289	-023
4				1.0	409	132	209	135	263	068	302	228	359	062	070	219	080	-142	-080	020	028	-003	159	099	115	220	032
5					1.0	252	029	038	199	105	156	138	191	167	-025	167	112	-084	002	-002	164	-009	089	009	039	132	037
6						1.0	114	068	128	139	185	132	055	083	039	124	113	-032	050	-071	018	-045	033	-029	120	122	122
7							1.0	162	408	188	273	105	170	088	086	169	096	-117	-013	-014	072	-033	145	-005	020	131	-035
8								1.0	257	220	168	065	069	-002	041	075	-024	029	045	-032	-073	-052	-147	-119	-026	161	111
9									1.0	297	356	156	200	128	-004	138	176	-155	-013	025	034	-128	127	-045	024	254	-018
10										1.0	258	012	148	107	-060	060	092	013	-017	-046	119	-103	109	-066	000	124	181
11											1.0	195	132	129	-027	079	155	-082	014	076	032	143	135	012	072	262	040
12												1.0	208	-075	079	045	063	-025	-026	-017	-055	-078	036	-076	-061	160	-045
13													1.0	005	005	027	100	-107	-023	-017	-011	-052	091	064	047	165	-065
14														1.0	-280	226	-007	-232	052	132	090	-082	121	021	308	051	156
15															1.0	-123	051	168	-050	-016	-037	105	-053	-021	-187	045	-148
16																1.0	044	-108	-030	-009	123	-026	091	-057	166	043	232
17																	1.0	010	054	019	-043	-017	012	-061	008	102	047
18																		1.0	-196	-065	070	160	-148	-182	-258	-165	054
19																			1.0	-085	004	-264	026	108	056	042	063
20																				1.0	-147	148	176	086	137	-003	-057
21																					1.0	-079	105	002	101	-101	-058
22																						1.0	-009	023	004	-180	-004
23																							1.0	133	309	085	002
24																								1.0	094	-027	-096
25																									1.0	-038	092
26																										1.0	114
27																											1.0

[a] all decimal points omitted except in diagonal

TABLE V

FULL SAMPLE UNROTATED PRINCIPAL AXIS FACTOR MATRIX

Variable	Factors								h^2
	I	II	III	IV	V	VI	VII	VIII	
Verbal IQ	-776[a]	-113	341	077	-054	-043	093	-126	766
Performance IQ	-706	-189	139	050	-065	007	129	113	590
Academic Average	812	-190	278	078	-078	049	021	-053	790
Vocabulary	-670	-041	439	085	-050	-093	143	-121	696
Inferences	-465	076	315	310	-229	-010	-155	078	500
Shortest Road	-341	062	-481	241	-354	-149	-423	-035	507
Seeing Problems	-539	-019	-158	-135	256	278	034	-188	514
Tin Can Uses	-356	-128	-438	010	106	-132	344	-293	568
Consequences	-643	025	-268	-158	174	122	-013	036	557
Circles	-397	084	-481	118	142	194	-102	-087	485
Symbol Production	-571	080	-241	-158	136	-001	-198	155	497
Hidden Figures	-413	-263	037	-109	-112	-155	001	473	513
Associations	-453	-091	264	-144	-084	009	127	038	329
Impulse Expression	-176	648	-042	153	060	-053	067	171	516
Conformity	-042	-546	128	-103	080	057	-267	-372	547
Category Width	-280	342	-006	434	002	-061	156	-093	421
Risk Taking	-231	-053	-065	001	-028	-177	-667	025	538
Stable Introversion	204	-495	-135	433	162	095	-159	001	553
MPI Extraversion	025	274	-181	-341	-518	001	-175	-296	611
MPI Neuroticism	018	216	178	-217	579	-303	-147	154	597
Anality	-078	163	047	326	-122	737	-100	065	714
MBTI E-I	167	-175	291	282	555	-149	-055	-202	596
MBTI S-N	-243	387	217	-146	276	164	-168	-064	412
MBTI T-F	027	232	345	-391	005	125	-042	-383	491
MBTI J-P	-125	630	212	047	201	-007	-057	-026	503
Socio-Economic Status	-424	-019	-111	-219	-190	-349	016	-019	399
Sex	-078	260	-298	454	-099	-426	017	-300	566
Sums of Squares	4.73	2.13	1.66	1.48	1.38	1.26	1.10	1.01	14.8
% Total Variance	17.5	7.90	6.14	5.48	5.12	4.67	4.09	3.73	54.7
% Common Variance	32.1	14.5	11.2	10.0	9.37	8.54	7.47	6.83	100.0

[a] all decimal points have been omitted

TABLE VI

FULL SAMPLE ROTATED FACTOR MATRIX

Variable	Factors								h^2
	I	II	III	IV	V	VI	VII	VIII	
Verbal IQ	840[a]	184	033	055	108	001	077	070	766
Performance IQ	695	251	-048	-002	045	-019	029	-197	590
Academic Average	835	249	-032	037	042	-080	142	-011	790
Vocabulary	807	046	104	075	126	027	016	098	696
Inferences	524	-007	209	-287	-218	049	223	012	500
Shortest Road	224	014	-045	-188	291	-089	571	-029	507
Seeing Problems	288	624	071	037	-094	-080	-041	132	514
Tin Can Uses	124	532	-243	-027	295	256	-230	071	568
Consequences	311	647	120	-081	-035	032	068	-121	557
Circles	017	638	007	-035	192	-147	130	-044	485
Symbol Production	234	524	195	-096	-045	089	258	-208	497
Hidden Figures	410	061	-076	-077	-144	149	126	-520	513
Associations	549	062	044	-078	-110	043	-043	-028	329
Impulse Expression	-010	078	584	-124	359	-079	-035	-131	516
Conformity	147	069	-432	245	-308	057	241	343	547
Category Width	185	092	222	057	549	-148	-048	018	421
Risk Taking	043	116	024	014	-047	083	715	-034	538
Stable Introversion	-193	008	-475	463	044	-203	140	-113	553
MPI Extraversion	-110	-000	-003	-672	017	055	-191	330	611
MPI Neuroticism	-082	023	514	362	-188	390	074	-049	597
Anality	026	106	083	-045	-002	-833	003	010	714
MBTI E-I	-035	-112	026	727	026	096	-003	208	596
MBTI S-N	142	173	534	063	-130	-095	089	199	412
MBTI T-F	107	-089	267	-147	-270	039	-057	548	491
MBTI J-P	042	-001	666	026	174	-067	022	150	503
SES	324	174	-028	-281	099	385	144	-071	399
Sex	-105	031	027	-013	707	153	150	-088	566
Sums of Squares	3.88	2.07	2.06	1.64	1.53	1.27	1.25	1.09	14.8
% Total Variance	14.4	7.66	7.64	6.06	5.66	4.70	4.64	4.03	54.7
% Common Variance	26.2	14.0	14.0	11.1	10.3	8.59	8.48	7.35	100.

[a] all decimal points have been omitted

unstable, impulsive and non-conformist. On this basis, the factor was identified as a factor of impulsivity.

The fourth factor was a further personality factor, defined by high loadings on Introversion - MBTI introversion loaded .727, Stable Introversion .463, and MPI extraversion -.672. MPI neuroticism also loaded highly on this factor (.362) and it seems to be a factor of neurotic introversion, with subjects scoring high on this factor tending to be of low SES, and to do poorly in school.

An attempt was made to interpret the fifth factor as its loadings including high figures for sex (.707), Category Width (.549), Impulse Expression (.359), and Conformity (-.308). The child scoring high on this factor would be characterized as male, disinclined to inhibit his own impulses, non-conformist, and possessing wide categories. On this basis, the factor was identified as a factor of masculine non-conformity.

Lesser factors were singletons and doubletons, on which only one or two tests loaded highly, and were thus considered to be statistical artifacts, rather than meaningful dimensions. Consequently, no attempt was made to interpret these factors.

Separate analyses were also carried out on the data yielded by the girls alone and by the boys alone. Correlations obtained by the sample of girls are shown in Table VII and unrotated factors shown in Table VIIIand rotated factors in Table IX. Again, the first factor is clearly a verbal intelligence factor, defined by the same tests as the first full sample factor, with almost identical loadings. In this case the verbal intelligence factor accounted for 13.5% of the total

TABLE VII
GIRLS' CORRELATION MATRIX
(N = 150)

Var.	1 Verbal IQ	2 Perform. IQ	3 Ac. Average	4 Vocab.	5 Inferences	6 Short Road	7 See. Probs.	8 Tin Cans	9 Consequences	10 Circles	11 Symb. Prod.	12 Hid. Fig.	13 Assns.	14 Imp. Express.	15 Conformity	16 Cat. Width	17 Risk Taking	18 Stab. Intr.	19 MPI Extrav.	20 MPI Neurot.	21 Anality	22 MBTI E-I	23 MBTI S-N	24 MBTI T-F	25 MBTI J-P	26 SES
1	1.00	562[a]	777	705	427	267	306	103	333	259	289	159	396	095	104	154	222	-158	-028	040	088	-094	311	159	192	204
2		1.0	562	397	243	262	323	174	405	247	369	339	199	015	-007	032	038	-081	-034	-092	-003	-198	159	026	005	284
3			1.0	635	452	304	367	086	399	251	385	259	305	120	123	154	205	-112	102	-037	174	-135	313	130	129	276
4				1.0	344	157	224	014	213	033	281	149	297	063	148	232	228	138	-040	047	047	-017	333	215	211	129
5					1.0	280	004	003	138	067	066	065	122	192	014	209	158	-096	017	-006	215	-041	147	025	098	098
6						1.0	164	031	350	188	211	093	021	101	155	093	141	-044	123	033	055	013	083	-007	121	128
7							1.0	079	392	162	267	070	051	083	054	113	-013	-180	050	116	097	053	263	096	097	093
8								1.0	160	111	133	053	-025	-096	042	113	007	051	035	-063	-141	-034	004	-097	045	140
9									1.0	160	350	077	044	223	024	079	208	-222	008	023	-020	-125	182	103	033	206
10										1.0	284	032	082	027	-008	-076	169	-037	-006	-103	146	-108	128	-031	-040	096
11											1.0	156	-010	152	010	024	195	-078	028	111	069	-155	147	062	071	266
12												1.0	147	-114	006	000	073	005	075	-053	-085	-140	-052	-065	-137	117
13													1.0	066	-151	-032	029	058	071	-046	047	-147	069	147	100	027
14														1.0	-262	172	029	-324	086	300	147	-106	209	106	411	153
15															1.0	-118	108	201	029	028	-060	115	-050	-049	-216	055
16																1.0	096	-107	024	071	209	-152	135	036	141	052
17																	1.0	056	051	027	-034	-070	-016	029	018	098
18																		1.0	-182	-029	015	208	275	-234	-329	-181
19																			1.0	-095	-047	-304	096	105	178	156
20																				1.0	-082	077	242	077	189	018
21																					1.0	-040	208	060	175	-099
22																						1.0	-094	-051	-092	-307
23																							1.0	238	310	117
24																								1.0	132	021
25																									1.0	021
26																										1.0

[a] all decimal points have been omitted, except in diagonals

TABLE VIII

GIRLS' UNROTATED PRINCIPAL AXIS FACTOR MATRIX

Variable	Factors								h^2
	I	II	III	IV	V	VI	VII	VIII	
Verbal IQ	-790[a]	-026	-400	053	126	-025	021	055	808
Performance IQ	-691	281	-050	134	100	-160	170	-103	652
Academic Average	-832	054	-304	083	007	-001	-033	-054	799
Vocabulary	-649	-118	-484	012	231	098	048	034	735
Inferences	-430	-165	-417	077	-385	115	156	-059	581
Shortest Road	-402	066	-088	-120	-320	288	-114	-163	413
Seeing Problems	-510	033	164	-357	241	-180	-142	-303	618
Tin Can Uses	-204	330	267	-045	040	026	214	-303	364
Consequences	-611	136	301	-200	037	-027	013	098	534
Circles	-402	276	204	-093	-318	-315	-328	265	666
Symbol Production	-575	171	287	-227	-069	044	-035	216	548
Hidden Figures	-284	354	-029	345	099	-044	305	-123	446
Associations	-300	-120	-280	443	224	-298	045	264	589
Impulse Expression	-269	-589	288	-119	-188	060	245	198	654
Conformity	-032	371	-298	-211	107	504	-388	-172	718
Category Width	-219	-317	-132	-087	-313	079	303	-306	462
Risk Taking	-270	126	-111	-034	-262	398	-047	540	623
Stable Introversion	306	469	-349	-168	-156	015	053	090	499
MPI Extraversion	-122	-161	278	463	-069	351	-378	256	670
MPI Neuroticism	-063	-336	085	-456	270	316	276	179	613
Anality	-150	-294	-195	-121	-511	-400	-263	-144	672
MBTI E-I	258	074	-354	-588	138	-087	054	-075	578
MBTI S-N	-436	-436	007	-165	184	-050	-228	-155	520
MBTI T-F	-199	-360	-033	061	382	-019	-388	174	501
MBTI J-P	-256	-635	130	-028	-039	031	041	-078	496
SES	389	069	290	259	002	372	103	-027	457
Sums of Squares	4.75	2.28	1.74	1.57	1.33	1.31	1.15	1.09	15.2
% Total Variance	18.3	8.77	6.68	6.04	5.13	5.05	4.43	4.19	58.6
% Common Variance	31.2	15.0	11.4	10.3	8.76	8.63	7.58	7.16	100.

[a] all decimal points have been omitted

TABLE IX

GIRLS' ROTATED FACTOR MATRIX

Variable	Factors								h^2
	I	II	III	IV	V	VI	VII	VIII	
Verbal IQ	843[a]	240	092	-002	128	048	052	035	799
Performance IQ	622	399	-088	119	-182	-042	-092	-174	645
Academic Average	800	315	059	120	038	128	128	-005	791
Vocabulary	800	060	146	-069	189	-063	128	040	727
Inferences	532	-075	259	040	-205	315	137	243	576
Shortest Road	243	209	128	143	-157	194	438	116	407
Seeing Problems	228	489	128	-085	117	015	186	-498	611
Tin Can Uses	047	273	-057	105	-384	-179	082	-288	361
Consequences	225	665	-144	070	-019	-090	025	-051	530
Circles	036	662	-199	060	057	382	-081	147	660
Symbol Production	168	690	117	060	-016	-058	072	115	544
Hidden Figures	387	069	-228	198	-346	-189	-169	-105	441
Associations	520	-076	-102	098	253	022	-465	073	582
Impulse Expression	-019	175	738	086	038	035	-188	164	648
Conformity	110	-014	-335	-036	101	-131	741	062	706
Category Width	221	-125	482	-004	-311	220	118	-058	459
Risk Taking	172	258	019	051	025	-064	174	697	620
Stable Introversion	-063	-120	-435	-380	-251	036	157	230	494
MPI Extraversion	-050	-074	047	756	148	052	223	-068	661
MPI Neuroticism	-036	072	535	-296	131	-431	129	083	607
Anality	070	039	176	-089	057	785	000	-045	667
MBTI E-I	-068	-116	-044	-692	020	-014	239	-117	570
MBTI S-N	265	167	394	050	392	119	126	-275	515
MBTI T-F	158	035	111	107	663	-050	-032	-059	497
MBTI J-P	089	-011	632	156	187	117	-052	-091	491
SES	181	225	133	491	-153	-267	094	079	452
Sums of Squares	3.52	2.28	2.27	1.72	1.37	1.37	1.36	1.18	15.1
% Total Variance	13.5	8.78	8.71	6.60	5.27	5.25	5.22	4.55	58.0
% Common Variance	23.4	15.2	15.0	11.4	9.10	9.07	9.02	7.86	100.

[a] all decimal points have been omitted

rotated variance and 23.4% of the common rotated variance. In general, the second factor too on which Symbol Production (.690), Consequences (.665), Circles (.662), and Seeing Problems (.489) loaded particularly highly, closely resembles the corresponding full sample factor. This factor, which derived 73% of its variance from the originality tests, and accounted for 53% of the common variance of those tests, was labelled originality, and again the substantial loadings of Non-Verbal IQ (.399) and Academic Average (.315) emphasized the relationship between these measures and originality. This factor accounted for 8.77% of the total rotated variance and 15.2% of the common rotated variance.

The third factor, too, closely resembled the corresponding full sample factor, with high loadings on Impulse Expression (.738), MBTI J-P (.632), Neuroticism (.535), Category Width (.482), and Stable Introversion (-.435), and it was labelled impulsivity, as was the full sample factor.

The fourth factor in this battery was another personality factor, superficially quite unlike the second personality factor yielded by the full sample data. Highest loadings were on Extraversion (.756), MBTI E-I (-629), SES (.491), Stable Introversion (-.380), and Neuroticism (-.296). In fact, this factor is a reflection of the corresponding full sample factor, and corresponds to it very closely. After the fourth factor, lesser factors were difficult to interpret meaningfully, and no further analysis of them was made.

Analysis of the boys' data yielded nine significant factors. The boys' correlation matrix is shown in Table X, unrotated factors are shown in Table XI, while rotated factors are shown in Table XII,

As was the case with the full sample and girl's data, the

TABLE X

BOYS' CORRELATION MATRIX

(N = 170)

Var.	1 Verbal IQ	2 Perform. IQ	3 Ac. Average	4 Vocab.	5 Inferences	6 Short Road	7 See Problems	8 Tin Cans	9 Consequences	10 Circles	11 Symb. Prod.	12 Hid. Fig.	13 Assns.	14 Imp. Express.	15 Conformity	16 Cat. Width	17 Risk Taking	18 Stab. Intr.	19 MPI Extrav.	20 MPI Neurot.	21 Anality	22 MBTI E-I	23 MBTI S-N	24 MBTI T-F	25 MBTI J-P	26 SES
1	1.00	640[a]	770	646	378	136	406	264	365	064	253	342	402	026	094	220	114	-102	-103	-071	-015	015	044	-094	-008	317
2		1.0	639	533	339	198	290	281	312	133	253	381	354	018	066	182	134	-030	-042	-018	071	008	100	-125	077	250
3			1.0	667	472	211	430	237	454	151	311	329	488	011	188	166	107	-046	-103	-071	-018	-002	-045	-163	-055	308
4				1.0	472	103	200	239	306	087	320	296	427	054	012	204	-058	-149	-121	-005	011	013	-004	-008	007	291
5					1.0	218	054	222	259	130	251	209	273	140	-053	115	063	-077	-018	006	107	028	030	-001	-038	159
6						1.0	080	346	088	067	151	228	109	035	-032	105	077	-034	-037	-176	-010	-111	-017	-029	099	094
7							1.0	241	421	222	284	130	277	104	104	244	193	-057	-065	-108	044	-119	044	-105	-050	168
8								1.0	346	277	196	086	178	041	072	085	-064	-004	041	015	018	-072	-096	-123	-127	158
9									1.0	348	366	216	344	066	-031	205	151	-094	-030	025	090	-122	081	-185	019	297
10										1.0	236	013	234	117	-053	094	021	037	-048	022	123	-103	099	-066	004	113
11											1.0	236	293	101	-052	122	112	-091	-004	040	-009	-128	122	-034	069	255
12												1.0	260	-035	126	107	106	-047	-110	012	-031	-019	111	-096	021	203
13													1.0	-027	137	121	184	-154	-112	008	-094	059	115	-039	-003	308
14														1.0	-264	220	-050	-178	007	-002	057	-062	059	-023	199	-051
15															1.0	-074	013	157	-107	-079	-031	098	-057	-023	-135	070
16																1.0	-025	-141	-116	-071	059	005	052	-111	160	-014
17																	1.0	-043	051	017	-049	041	039	-145	-013	095
18																		1.0	-220	-101	148	104	-116	-116	-189	-166
19																			1.0	-067	075	-220	-043	125	-098	-069
20																				1.0	-245	240	103	087	083	-011
21																					1.0	-134	-015	-084	014	-096
22																						1.0	086	110	130	-060
23																							1.0	026	313	-004
24																								1.0	070	-008
25																									1.0	007
26																										1.0

[a] all decimal points have been omitted, except in diagonals

TABLE XI

BOYS' UNROTATED PRINCIPAL AXIS FACTOR MATRIX

Variable	Factors									h^2
	I	II	III	IV	V	VI	VII	VIII	IX	
Verbal IQ	-763[a]	298	-039	199	-050	042	149	-075	-139	764
Performance IQ	-704	237	-057	184	098	-029	-047	-053	-070	609
Academic Average	-811	326	062	171	025	046	101	-068	-021	815
Vocabulary	-690	283	-161	262	-142	278	-022	-060	-064	756
Inferences	-481	109	-182	347	-104	155	-326	-354	160	689
Shortest Road	-276	-040	-044	308	006	-363	-269	360	400	666
Seeing Problems	-574	-218	190	-123	113	-143	361	051	-251	657
Tin Can Uses	-454	-221	294	-185	-055	395	040	196	086	581
Consequences	-673	-291	077	-210	017	026	099	-129	-003	606
Circles	-376	-454	105	-302	174	214	-255	-048	005	592
Symbol Production	-555	-245	-105	-174	-117	-063	-243	036	074	493
Hidden Figures	-486	202	-065	010	022	-243	-246	291	163	513
Associations	-598	179	-071	-224	-105	-100	050	002	-152	491
Impulse Expression	-105	-436	-398	237	104	173	219	-091	156	537
Conformity	-084	447	375	-213	106	-064	033	273	-277	561
Category Width	-320	-214	-251	207	306	052	428	179	001	566
Risk Taking	-181	013	038	-227	-057	-623	154	-520	083	778
Stable Introversion	146	188	453	-043	551	085	-316	-106	072	691
MPI Extraversion	156	-363	081	113	-581	-102	-084	-119	-276	621
MPI Neuroticism	064	138	-377	-544	-106	299	-045	-168	246	652
Anality	-036	-202	235	401	313	051	-285	-269	-364	689
MBTI E-I	088	466	-314	-278	284	193	050	-185	-018	555
MBTI S-N	-099	-079	-451	-267	259	-264	-315	001	-334	638
MBTI T-F	195	095	-295	-014	-343	219	-235	220	-409	571
MBTI J-P	-006	-136	-662	013	309	-176	-032	170	-160	639
SES	-446	136	045	-163	-341	-108	-066	025	047	382
Sums of Squares	5.01	1.84	1.83	1.50	1.46	1.27	1.14	1.04	1.03	16.1
% Total Variance	19.3	7.08	7.05	5.75	5.62	4.87	4.39	4.00	3.96	62.0
% Common Variance	31.1	11.4	11.4	9.27	9.07	7.85	7.08	6.46	6.38	100.

[a] all decimal points have been omitted

TABLE XII

BOYS' ROTATED FACTOR MATRIX

Variable	Factors									h^2
	I	II	III	IV	V	VI	VII	VIII	IX	
Verbal IQ	847[a]	053	035	-018	011	012	-020	196	058	764
Performance IQ	725	168	107	-019	123	097	090	083	062	609
Academic Average	850	122	103	-062	140	017	-099	165	083	815
Vocabulary	842	027	061	094	-023	-031	-038	-036	-172	756
Inferences	613	110	118	277	-001	144	-036	-433	033	689
Shortest Road	124	794	-021	152	065	-016	089	-073	-014	666
Seeing Problems	317	007	331	-052	-056	085	000	628	208	657
Tin Can Uses	196	541	178	-048	-213	141	-187	302	214	581
Consequences	379	046	612	082	-033	-004	-016	205	189	606
Circles	030	-016	753	063	069	104	048	026	-050	592
Symbol Production	293	269	527	067	-134	-105	138	-019	067	493
Hidden Figures	370	529	117	-166	121	-124	158	-011	004	513
Associations	528	039	224	-190	-066	-207	156	173	153	491
Impulse Expression	027	-025	093	706	-006	018	065	135	-076	537
Conformity	139	-071	-060	-061	172	-014	-046	204	-139	561
Category Width	207	069	006	432	175	022	112	528	-098	566
Risk Taking	083	013	037	-030	-069	-062	069	014	869	778
Stable Introv.	-161	-051	102	-340	574	394	-112	-198	007	691
MPI Extraversion	-152	-043	041	032	-744	141	-096	-088	052	621
MPI Neuroticism	-035	-319	199	083	141	-605	128	-317	-012	652
Anality	039	-100	142	071	-021	803	056	-057	-027	689
MBTI E-I	127	-396	-163	-074	421	-267	275	-162	002	555
MBTI S-N	003	003	188	-049	004	032	768	-044	085	638
MBTI T-F	004	-157	-126	-145	-415	-105	296	-182	-454	571
MBTI J-P	-033	092	-072	315	077	-044	703	127	-089	639
SES	381	182	196	-192	-201	-256	-065	-025	135	382
Sums of Squares	4.13	1.70	1.67	1.61	1.49	1.48	1.45	1.39	1.28	16.2
% Total Variance	15.9	6.55	6.43	6.20	5.75	5.70	5.58	5.36	4.94	62.4
% Common Variance	25.5	10.5	10.3	9.94	9.21	9.13	8.95	8.59	7.92	100.

[a] all decimal points have been omitted

first factor is defined by the tests of verbal intelligence. Highest loadings include Academic Average (.850), Verbal IQ (.847), Vocabulary (.842), Non-Verbal IQ (.725), Inferences (.613), and Associations (.528), and on this basis, the factor was labelled Verbal Intelligence. The resemblance of the three groups' first factors is emphasized by their highly comparable variance contributions in the three factor matrices (full sample -26.6% of rotated common variance; girls - 23.4%; boys - 25.5%).

The second boys' factor was defined by Tin Can Uses (.541), Hidden Figures (.529) and Symbol Production (.269), as well as by Shortest Road (.794), MBTI E-I (-.396), and Neuroticism (-.319). Subjects scoring high on this factor would be extraverted, stable, flexible, original and skilled in the kind of perceptual skill represented by the Shortest Road test. Consequently, this factor, which derived 38% of its variance from Tin Can Uses, Hidden Figures, and Symbol Production, was labelled non-verbal originality, although with some reserve.

The third factor was more clearly defined by its loadings on Circles (.753), Consequences (.612), Symbol Production (.527), and Seeing Problems (.331). The factor derived 79% of its variance from these four tests and was identified as a factor of verbal originality. Hence, the boys were interpreted as having made use of two major factors of originality in responding to the test battery, whereas there was no evidence of a similar level of differentiation of originality in the girls. The total variance contribution of the two toy's originality factors was 20.8% of the common rotated variance.

The fourth boys' factor corresponded to the third factor in the other factor matrices, loading highly on Impulse Expression (.706), Conformity (-.661), Category Width (.432) and Stable Introversion (-.340), and was identified as a factor of impulsivity. As was the case in the other two batteries, the second personality factor was defined by high loadings on MPI Extraversion (-.744), Stable Introversion (.574), MBTI E-I (.421), and MBTI T-F (-.415). This factor resembles the second personality factor in the girls' data, and was identified as a factor of introversion, or perhaps, in Eysenck's sense (1963b, p. 51), a factor of sociability.

Subsequent factors are less subject to meaningful interpretation, especially as they tend to be singletons or doubletons, and so no attempt was made to interpret them.

The Relationship between Originality and Personality

A preliminary attempt was made to demonstrate the relationship between originality and a number of non-intellective variables, including several personality tests, by comparing group means of the high and low originals, selected according to the procedure outlined earlier (p. 48). Table XIII shows the group means, SDs and univariate F-tests of the significance of mean differences between the low originals and the high originals.

It can be seen that high and low originals differed significantly on several other measures, apart from the defining tests of originality. The highly original children scored significantly differently from the low originals on Socio-Economic Status, Associations, Category Width, Risk Taking, and MBTI E-I. These

TABLE XIII

MEAN DIFFERENCES BETWEEN HIGH AND LOW ORIGINALS

	High Originals		Low Originals		F*	p
Test	Mean	SD	Mean	SD		
Socio-Economic Status	13.53	3.50	10.66	3.55	10.37	<.01
Impulse Expression	3.28	2.60	2.69	2.62	0.81	n.s.
Associations	5.78	4.01	3.13	2.88	8.98	<.01
Conformity	9.63	2.79	9.66	2.26	0.01	n.s.
Category Width	50.22	15.61	37.78	16.00	9.58	<.01
Risk Taking	450.94	113.90	367.03	114.87	8.80	<.01
Stable Introversion	46.63	7.72	49.16	7.84	1.61	n.s.
MPI Extraversion	11.84	3.59	12.25	3.11	0.17	n.s.
MPI Neuroticism	7.19	3.21	7.38	2.13	0.13	n.s.
Anality	50.81	12.20	49.56	14.15	0.12	n.s.
MBTI E-I	87.53	18.28	101.25	19.39	8.24	<.01
MBTI S-N	91.13	17.11	84.59	16.12	2.39	n.s.
MBTI T-F	97.81	16.45	102.94	16.67	1.47	n.s.
MBTI J-P	88.95	26.76	92.66	16.56	0.51	n.s.

* 1/62 degrees of freedom

significant differences suggest strongly that the two extreme originality groups differ in terms of dimensions other than those measured by the tests of originality, and that, in particular, the highly original children were of higher socio-economic status, were better able to make the mediational linkages required in the Associations test, possessed wider categories, were more prepared to take risks, and were more extraverted than the subjects whose originality scores were low.

However, in view of the significant differences in IQ between these two groups, differences on tests which correlate highly with intelligence may well reflect merely group differences in IQ, rather than differences directly related to originality. This is particularly true of Associations and socio-economic status, which correlated .394 and .271 respectively, with verbal IQ. Hence, significant differences between originality groups matched, at least roughly, for intelligence, are of considerably greater use in ascertaining where differences between high and low originals lie. Means, Standard Deviations and univariate Fs of test data for high original and low original/average IQ groups are shown in Table XIV.

In the case of these two groups, mean differences reached levels of significance in the case of Category Width, Risk Taking, and MBTI S-N, while there was again a marked tendency for the high original group to be more extraverted than the low originals ($F = 3.84$, $p = .06$). Category Width and Risk Taking differentiated significantly between groups on both occasions.

These findings indicate that it is possible to discriminate significantly between groups, defined a priori as different in

TABLE XIV

MEAN DIFFERENCES BETWEEN HIGH ORIGINALS AND LOW ORIGINAL/AVERAGE IQs

	High Originals		Low Originals			
Test	Mean	SD	Mean	SD	F*	p
Socio-Economic Status	13.53	3.50	12.28	3.42	2.23	n.s.
Impulse Expression	3.28	2.60	2.90	2.57	0.50	n.s.
Associations	5.78	4.01	4.46	3.85	1.95	n.s.
Conformity	9.63	2.79	9.33	2.78	0.52	n.s.
Category Width	50.22	15.61	40.74	14.71	7.80	$<.01$
Risk Taking	450.94	113.90	368.67	125.00	11.80	$<.01$
Stable Introversion	46.63	7.72	46.44	6.90	0.05	n.s.
MPI Extraversion	11.84	3.59	12.18	3.23	0.02	n.s.
MPI Neuroticism	7.19	3.21	7.36	3.03	0.25	n.s.
Anality	50.81	12.20	51.31	12.13	1.88	n.s.
MBTI E-I	87.53	18.28	95.15	21.14	3.84	$\simeq .06$
MBTI S-N	91.13	17.11	82.64	16.42	4.32	$<.01$
MBTI T-F	97.81	16.45	103.44	16.30	2.80	n.s.
MBTI J-P	88.95	26.76	88.51	22.01	0.15	n.s.

* 1/69 degrees of freedom

originality, on the basis of non-intellective measures, including several personality tests.

This point of view was further tested by discriminant function analysis of the experimental data. Table XV shows the total cross-products matrix (the T matrix) for the high and low originality groups, Table XVI shows the within groups cross-products matrix (W matrix) for these two groups, while Table XVII shows the normalized weights associated with the 14 tests, on the basis of which the attempt to discriminate between the two groups was made.

Essentially, this procedure involves testing the hypothesis that it is not possible to obtain significant discriminations between groups, on the basis of the best possible linear combination, of the tests employed. This hypothesis was tested, using the procedure outlined in Cooley & Lohnes (1962, pp. 117-118), and the discrimination obtained was highly significant ($F = 3.03$, $df = 14/49$, $p. < .01$).

The normalized weights which indicate the weighting to be given to each test in calculating each individual's score on the discriminant function, are, in effect, an indication of the relative efficiency of each test in separating groups, within the context of this particular battery.

In discriminating the high originals from the low originals, the highest weighted tests were Socio-Economic Status, Associations, Conformity and Category Width. Of these tests, group means were significantly different only in the case of Category Width, on the basis of the univariate Fs. However, discriminant function methods

TABLE XV

TOTAL CROSS PRODUCTS MATRIX FOR HIGH VERSUS LOW ORIGINALS

(N = 64)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 SES	927.4	40.0	260.2	60.1	209.0	6789.1	-259	-87.2	25.3	-341.1	-835.4	-282	818.2	-1592
2 Impulse Expr.		440.9	-8.5	-75.3	247.0	1872.9	35.8	30.0	-21.7	193.1	-543.5	-251	-541.6	-240.3
3 Associations			891.8	18.4	209.0	2777.4	-355	-134	71.8	-676.4	-822.7	1152	-2462	327.8
4 Conformity				414.7	-522	799.6	208.4	-51.9	71.4	228.3	890.3	-141	333.6	-730.6
5 Category Width					18478	-8585	-1347	-67.0	-51.0	1609.0	-2662	3103	-242.0	2729.0
6 Risk Taking						994928	-6771	-404	-3555	8735	-25971	-14198	-20655	-56334
7 Stable Introversion							3976	-383	-84.0	1950.3	3029.8	-107	-851.3	-1250
8 MPI Extraversion								724.8	-120	4.4	-1363	-222	1065.8	429.1
9 MPI Neuroticism									474.9	-706.3	948.6	891.5	-133.7	682.1
10 Anality										11198	-3818	-1486	1571.5	-18225
11 MBTI E-I											25755	205.6	2159.2	3422.7
12 MBTI S-N												18342	661.3	9911.6
13 MBTI T-F													17953	1858.0
14 MBTI J-P														31941

TABLE XVI

WITHIN GROUPS CROSS PRODUCTS MATRIX FOR HIGH VERSUS LOW ORIGINALS

(N = 64)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 SES	795.1	12.7	138.0	61.0	-363	2929.4	-142.9	-68.5	33.9	-398.6	-202.9	-582.5	-582.4	-1404
2 Impulse Expr.		435.3	-33.7	-75.0	128.8	1075	-75.0	33.9	-19.9	181.7	-412.9	-313.1	-492.9	-201.7
3 Associations			778.9	19.7	-319.5	788.5	-247.2	-117.0	79.8	-729.5	-238.4	875.5	-29.0	500.5
4 Conformity				414.7	-515.7	841.6	207.2	-52.1	71.3	338.9	883.4	-137.9	331.0	-732.6
5 Category Width					16002	-25282	-843.2	13.8	-13.6	1360	74.2	1803	777.8	3537
6 Risk Taking						837282	-3372	141.4	-3302	7057	-7512	-22966	-13774	-50880
7 Stable Introversion							3873	-399.1	-91.6	2001	2472.9	157.5	-1059	-1414.1
8 MPI Extraversion								722.2	-121.0	12.5	-1453	-179.1	1032.5	402.7
9 MPI Neuroticism									474.3	-702.6	907.4	911.1	-154.1	670.5
10 Anality										11172	-3543	-1617	1674	-1741
11 MBTI E-I											22730	1642	1032	2529
12 MBTI S-N												17659	1197	10336
13 MBTI T-F													17533	1525
14 MBTI J-P														31677

TABLE XVII

NORMALIZED WEIGHTS FOR DISCRIMINATING BETWEEN HIGH AND LOW ORIGINALS

Test	Normalized Weights
Socio-Economic Status	.621
Impulse Expression	.176
Associations	.498
Conformity	.461
Category Width	.224
Risk Taking	.026
Stable Introversion	.042
MPI Extraversion	-.186
MPI Neuroticism	-.083
Anality	-.018
MBTI E-I	-.139
MBTI S-N	.096
MBTI T-F	-.014
MBTI J-P	.008

indicate the relative efficiency of these measures, within a particular context of tests considered simultaneously, not one test at a time. The high weights for tests for which univariate Fs indicated little discriminating power indicate one of the advantages of multivariate procedures. In this case, the high discriminating power of some tests for which group means were almost identical is a function of between-test intercorrelations. This point has been discussed at great length by Cooley and Lohnes (1962, p. 121).

Interpretation of these weights is complicated by the confounding of originality and IQ in these two groups. Nevertheless, the weights of Conformity and Category Width are consistent with the theory underlying this study.

Weights involved in discriminating between high originals and low original/average IQs lent themselves to clearer interpretation. Table XVIII shows the T matrix for these two groups, Table XIX shows the W matrix for the same groups, and Table XX shows the subsequent normalized weights. The discrimination between the two groups was again significant ($F = 2.31$; $df = 14/56$; $p. < .05$), and tests contributing most to this discriminant function were Conformity, Impulse Expression, SES, Category Width, MBTI S-N, and Stable Introversion.

Hence, with some control of IQ, highly original subjects differed from unoriginal subjects in being non-conformist, impulsive extraverts, in relying on the 'unconscious associations' connected with stimuli and in possessing wide categories.

TABLE XVIII

TOTAL CROSS PRODUCTS MATRIX FOR HIGH ORIGINALS VERSUS LOW ORIGINAL/AVERAGE IQs

(N = 71)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 SES	875.2	-43.2	158.6	-1.8	182.1	5984	-256.2	-11.6	53.0	-454.0	-631.0	-235.8	-353.0	-513.9
2 Impulse Expr.		476.6	69.7	-92.3	317.9	1890	-33.6	51.8	18.5	295.5	-430.5	-529.3	-698.5	130.2
3 Associations			1120	14.1	291.9	-894.9	-193.0	-124.1	131.8	-346.3	-419.8	1202	-265.6	1014
4 Conformity				551.6	-605.4	-953.6	304.8	-10.9	65.7	127.2	812.2	185.6	193.2	-1002
5 Category Width					17843	-7958	-410.5	100.9	176.7	123.9	-22.7	2090.5	-1836	5011
6 Risk Taking			1143759	-10561	-1854	-4105	-7748	-28000	-33294	-18481	-5888			
7 Stable Introversion				3777.7	-429.0	-229.4	851.8	1748.4	-706.1	-1928	-2371			
8 MPI Extraversion					821.9	-213.5	-118.1	-1685.4	-554.9	827.2	975.9			
9 MPI Neuroticism						688.3	-397.6	1138.6	824.7	58.9	660.0			
10 Anality							10507.5	-3796.2	-1430.0	-642.3	-3835.2			
11 MBTI E-I								29032.3	1535.3	2125.1	-1167.0			
12 MBTI S-N									21319.6	-1291.6	5782.8			
13 MBTI T-F										19632.4	744.9			
14 MBTI J-P											41819.6			

TABLE XIX

WITHIN GROUPS CROSS PRODUCTS MATRIX FOR HIGH ORIGINALS v. LOW ORIGINAL/AVERAGE IQs

(N = 71)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 SES	847.8	-51.6	129.6	-8.2	-25.8	4178	-260.4	-4.3	56.8	-443.1	-463.7	-422.1	-229.6	-515.7
2 Impulse Expr.		474.0	60.8	-94.2	254.0	1335	-35.8	54.1	19.7	298.9	-379.1	-586.5	-660.5	129.7
3 Associations			1089.1	7.3	72.1	-2803.4	-197.4	-116.3	135.8	-334.8	-243.0	1005.3	-135.1	1011.9
4 Conformity				550.1	-654.0	-1375	303.8	-9.2	66.5	129.7	851.3	142.1	222.0	-1002.5
5 Category Width					16264.9	-21660	-442.0	156.8	205.2	206.3	1246.8	677.5	-899.2	4997.9
6 Risk Taking						1024785	-10834	-1369	-3857	-7032	-16977	-45562	-10349	-6005
7 Stable Introversion						3777.0	-427.9	-228.8	853.5	1773.7	-734.3	-1909.6	-2371.5	
8 MPI Extraversion						819.9	-214.5	-121.0	-1730.4	-504.8	794.0	976.3		
9 MPI Neuroticism						687.8	-399.1	1156.1	850.2	42.0	660.2			
10 Anality						10503.1	-3862.6	-1356.9	-691.3	-3834.5				
11 MBTI E-I						28011.0	2672.0	1371.6	-1156.1					
12 MBTI S-N						20054.4	-453.1	5770.8						
13 MBTI T-F						19076.5	752.8							
14 MBTI J-P						41819.4								

TABLE XX

NORMALIZED WEIGHTS FOR DISCRIMINATING BETWEEN HIGH ORIGINALS AND LOW ORIGINAL/AVERAGE IQs

Test	Normalized Weights
Socio-Economic Status	.368
Impulse Expression	.419
Associations	.208
Conformity	.632
Category Width	.281
Risk Taking	.042
Stable Introversion	.237
MPI Extraversion	-.073
MPI Neuroticism	-.123
Anality	-.042
MBTI E-I	-.127
MBTI S-N	.264
MBTI T-F	-.003
MBTI J-P	-.040

CHAPTER VI

DISCUSSION

In general, the originality tests correlated significantly with IQ, and it was concluded that the two quantities are substantially related. The range of correlations between IQ and the various originality tests (.064 to .406 over the three groups studied) is consistent with the range (.02 to .27) reported by Getzels and Jackson (1962, p.5), and is also in agreement with Taylor's (1964, pp. 35-36) summary of the relationship between the two dimensions. However, the conclusion drawn in this study, that originality and intelligence are substantially overlapping concepts, contrasts with the conclusions of those authors, (Getzels & Jackson, 1962) who have suggested in the past that originality is essentially independent of IQ, basing their conclusions on data biased by variance restrictions. In contrast to the Getzels and Jackson conclusions, the present findings are clearly supportive of the position adopted by Pribram (1964, pp. 107, 108) when he argued that the suggestion that originality and conventional intelligence are independent is a fiction, for which there is no neurological support.

Not only were there substantial correlations between originality variables and IQ variables, as was the case in the Getzels and Jackson study (1962, p. 20), but some of the correlations between tests in the cluster of IQ variables and tests in the cluster of originality variables were larger than the lower within-cluster correlations. These findings which support assumption 1, cast further doubt on the validity of regarding originality and intelligence

as separate dimensions of intellect. Nevertheless, the two groups of tests did form poorly defined clusters, supporting Thorndike's (1963) view that, although a vaguely defined dimension of originality does exist, it cannot be regarded as completely independent of conventional intelligence.

Factor analyses of the data obtained from boys and girls separately, as well as the full-sample data, supported assumption 2. All three sets of data yielded significant factors defined by the tests of originality - the full sample data yielded a single, integrated originality factor, and the girls' data also yielded a single originality factor. However, the boys' data yielded two factors defined by their high loadings on the tests of originality.

In all three batteries, the largest factor was a factor of conventional, verbal intelligence, accounting for about a quarter of the total, rotated common variance, but in all cases, this factor, although defined by very high loadings on the conventional tests, accounted for substantial portions of the variance of originality measures. On the other hand, conventional tests loaded substantially on the originality factors, too. This cross-loading of tests emphasizes the overlapping nature of the two concepts of originality and intelligence.

The principal axis method yields orthogonal factors, and this orthongonality is retained by the varimax method of rotation. Consequently the 'originality' factors in the factor matrices obtained in this study were independent of the intelligence factors. However, the presence of cross-loadings suggest that oblique rotations would

have yielded factors of which the originality tests were purer measures, although these factors would have correlated with the intelligence factors. Hence, further analysis of the data which utilized oblique rotational methods, would probably clarify the overlapping nature of originality and conventional intelligence.

The full sample data yielded a single originality factor, which accounted for 14.0% of the rotated common variance, and about 66% of the common variance of the originality tests. In the case of the girls only, a single factor of originality was also obtained. This factor accounted for 15.2% of the rotated, common variance of the entire battery, and for 61% of the rotated, common variance of the originality tests.

The appearance of well-defined originality factors in the factor structures obtained in the present study is not consistent with the results of factor analyses of the Getzels & Jackson (1962) data which were carried out by Thorndike (1962) and Marsh (1964). Thorndike did obtain a factor defined by the originality measures, but this factor contributed less to the variance of those measures than did the first factor, a factor of general intelligence. Marsh carried out a centroid analysis of the data and concluded that no factor of originality could be identified in the resulting factor matrix. Similarly, although Sultan (1962) obtained a factor of originality, he reported that it accounted for only negligible portions of the variance of a battery of tests administered to a sample of English Grammar School pupils, despite the fact that the battery included a number of Guilford-type originality tests.

By contrast, the data of the present study yielded substantial factors, which accounted for major portions of the common variance of the originality tests, and, in this respect, the present findings are strikingly comparable to those reported by McGuire (1961). He analyzed the responses of grade seven children to a battery of tests, including measures of both 'convergent' and 'divergent' thinking, obtaining a first factor of conventional intelligence and a substantial second factor identified as a factor of 'divergent thinking' (1961, p. 27). This factor was defined by its high loadings on a test of sensitivity to problems, a test of the ability to imagine the consequences of unusual, hypothetical events, and by the fact that high scorers on the factor tended to produce large numbers of statistically uncommon responses. Hence, the originality factors yielded in the present study, by the data of the full sample and of the girls only, bear an extremely close resemblance to McGuire's 'divergent thinking' factor.

Other writers too (Guilford, 1960; Anderson, 1964; Sultan, 1962) have reported obtaining factors of originality in test data, despite the findings of Thorndike and Marsh. However, there is some disagreement among these writers, and among theorists, concerning the number of originality factors which may be isolated. Guilford (1960) has reported that there are several, Anderson (1964) obtained two, while McGuire (1961) and Sultan (1962) reported only one originality factor. Among theorists, Gordon (1961) has suggested that originality is a unitary trait, whereas Taylor (1964) argues that there are probably, at the least, verbal and non-verbal dimensions of originality. The present findings tend to resolve some of the disagreement

between authorities, in that the girls' data yielded a single factor, while the boys' data yielded two factors of originality.

This sex difference between factor structures can be interpreted as resulting from differences in the degree to which originality skills are differentiated in the two sexes, at the age level involved in this study. Although about the same proportion of the variance of originality tests is accounted for by the single girls' factor (61% of their common variance; 33% of their total variance) as is accounted for by the two boys' factors combined (61% of common 34% of total variance), this variance is divided in the case of the boys among two factors, whereas, in the case of the girls, it is consolidated in a single integrated factor of originality. However this point could be considerably amplified by the use of a factor-matching technique which maximized the degree of overlap between the two factor matrices.

These data indicate that, at least at the age levels involved in this study, originality is a more differentiated domain of intellect in boys than in girls. Hence, the present findings tend to integrate those studies in which single originality factors have been obtained, and those in which two factors have appeared.

The better differentiation of originality in boys is consistent with experience, in that original productions tend to be produced mainly by males. However, it cannot be concluded that this difference represents any innate differences between sexes. In our culture, attributes prized in boys may not be prized in girls at all (Bandura and Walters 1963, p. 19), so that the kind of cognitive

skills required for high originality scores (willingness to take risks, for example) may well be reinforced in males, but not in females, hence, strong female sex-role typing would lead to low originality scores. Torrance (1963, p. 103 and p. 152) has made a similar point, summarizing some current research and theory in this area, while Pettigrew, (1958) and Wallach and Caron (1959) have shown that there are significant sex differences in category width. Bandura and Walters (1963) attribute these differences to differing patterns of differential reinforcement of boys' and girls' behaviour.

Lesser factors, after the originality factors, were mainly of the personality sort, and the two largest of these, which made substantial contributions (between 11% and 14%) to the rotated common variance of the present test battery, appeared consistently in all three batteries. They were identified as factors related to impulsivity and introversion/extraversion, respectively.

The full sample factors were identified as factors of unstable impulsivity and of unstable introversion, the girls' factors were labelled unstable impulsivity and stable extraversion, and the boys factors were identified as factors of impulsivity and of unstable introversion. Hence, there is a high degree of correspondence between the major personality factors yielded by the three batteries. This correspondence is especially close when it is borne in mind that stable extraversion and unstable introversion are opposite poles of the same factor - unstable introversion is merely the reflection of stable extraversion.

Eysenck (1963b, p. 51) has postulated the existence of two independent personality dimensions, the one characterized by impulsivity,

the other by 'sociability', and this point of view is supported by the present data, which yielded orthogonal factors of impulsivity and stability.

Further analysis of the relationship between personality and originality involved testing the hypothesis that highly original individuals can be significantly differentiated from highly unoriginal subjects on the basis of non-intellective traits. The two basic groups for whom this hypothesis was tested consisted of the highest and lowest 32 subjects on full scale originality, and significant discriminations were made. However, in view of the very large differences in IQ between the two groups, selected solely on the basis of originality scores, it might be argued that originality and IQ were confounded in this comparison. Consequently, a second low originality group was selected, all of whose members were at least of average intelligence, and the hypothesis re-tested, by comparing this group with the high originals. Differences were still significant, but again, even the low originals of average intelligence differed significantly from the high originals as far as intelligence was concerned.

IQ differences could have been eliminated by extending the high original group downward, and the low original group upward, so that originality differences between groups were not so extreme. This procedure would have avoided confounding originality and intelligence, at the expense of dealing with originality groups which no longer represented the two extremes. However, in view of the fact that the kinds of differences being examined in this study have seldom been reported on in the literature, extreme groups were required in order to

make differences as apparent as possible.

The difficulty of obtaining extremely high and extremely low originality groups which do not differ in intelligence is consistent with Pribram's (1963; 1964) position, and emphasizes the overlapping nature of the two concepts. It may well be almost impossible to define extremely high originality in the absence of high intelligence. However, there is little evidence to suggest that non-intellective differences of the kinds involved in the present study are related to differences in IQ, despite the wealth of research on the concept of intelligence. Consequently, the differences between high and low originality groups which have been demonstrated in this study are unlikely to result from IQ differences.

Univariate comparisons indicated that the high and low original subjects differed significantly from each other on the tests of Category Width, Risk Taking and MBTI E-I, for both occasions on which mean differences were tested, and hence, that these tests are the most consistently useful univariate discriminators between highly original and highly unoriginal individuals. This finding suggests that the important differences between original and unoriginal people centre around the willingness of originals to take risks, their capacity to perceive the commonality between apparently discrepant data (and, hence, to push back the boundaries of the familiar), and in their essentially extraverted nature.

Significant between-group discriminations were obtained by the use of multivariate procedures, too. In this case, the single most consistent test was the test of conformity which, within the

particular context of tests employed, was a highly weighted discriminator in both cases. Of the personality tests, Impulse Expression and Category Width were the next most important discriminators. These findings support the conception of the highly original individual as impulsive (Freud, 1908; Couch & Keniston, 1960) and non-conformist (Crutchfield, 1955; Cattell, 1963), with a marked capacity for the integration of what seem to be separate data (Maslow, 1954; Bruner, 1963; Pribram, 1964).

The consistent discriminating power of SES indicates that original and unoriginal children tend to come from different kinds of home backgrounds. This difference is consistent with the literature on the concept of intelligence (Cropley, 1964), with which originality overlaps, and is in keeping with other studies cited by Roe (1963, p. 161), in all of which highly creative individuals were of relatively high SES. Roe attributed this class difference to differing value systems, and to different interest patterns, although Bandura and Walters (1963) account for it in terms of differing patterns of reinforcement in different social classes. Of course,these two apparently discrepant formulations can be made congruent by noting that Skinner's (1961, p. 576) definition of 'value' is in terms of what is reinforcing.

The basic argument advanced in this thesis was that, in the absence of precise formulations of the mechanics of more complex behaviour, originality is best conceived of as involving the use of a certain kind of internal rules which mediate impulsive and unconventional behaviour. Several authors (Crutchfield; Barron; Couch and Keniston;

Eysenck) have demonstrated the existence of consistent behavioural syndromes (personality types) marked by impulsivity and non-conformity, and it was consequently hypothesized that highly original and highly unoriginal individuals would differ significantly on the basis of the personality dimensions described by those authors.

The data obtained in this study have demonstrated that predictable differences do exist between highly original and unoriginal individuals, at statistically significant levels. At present, however, it is difficult to deal with these differences except in terms of the mediational mechanisms adopted for the purposes of this study, although a more objective, behaviouristically-oriented formulation may be worked out in the future.

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APPENDIX A

RAW SCORES

Subs.	Sex	Verbal IQ	Ac. Average	Inferences	See. Probs.	Tin Cans	Circles	Short Road	Consequences	Sym. Prod.	Hid. Fig.	Vocab.	SES	Imp. Express	Associations	Conformity	Stab. Intr.	Cat. Width	Anality	Risk Taking	MBTI E-I	MBTI S-N	MBTI T-F	MBTI J-P	Perform. IQ	MPI Extrav.	MPI Neurot.	Tot. Orig.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
001	0	150	83	16	27	11	0	37	29	39	17	28	13	1	9	7	51	52	52	478	101	125	89	133	131	10	14	36
002	0	130	73	12	21	9	0	26	31	36	10	13	19	3	3	15	50	58	24	618	87	73	101	85	111	16	5	28
003	0	124	80	10	22	5	10	36	42	37	13	25	10	0	12	11	51	50	36	489	51	75	121	73	127	15	5	51
004	0	137	81	16	13	3	12	28	23	39	12	30	16	9	10	11	43	49	37	568	77	107	123	119	109	13	11	32
005	0	130	75	13	22	1	5	26	27	19	23	23	10	2	12	13	47	18	32	503	111	107	103	93	107	16	3	31
006	0	134	84	12	29	3	10	20	50	24	13	27	17	4	14	9	38	25	54	399	77	91	107	111	128	8	12	36
007	0	135	72	12	23	0	9	27	36	44	10	19	10	10	4	11	49	49	49	524	133	139	125	145	106	10	55	32
008	0	126	76	10	34	4	0	25	46	32	7	21	8	5	5	7	32	44	58	337	125	107	121	153	99	6	8	29
009	0	140	79	16	26	2	0	25	37	22	12	27	17	5	2	12	31	59	52	452	75	109	87	155	116	13	10	26
010	0	135	74	17	14	0	0	29	18	14	10	22	11	3	3	14	54	30	74	492	127	57	131	89	98	14	3	15
011	0	125	82	13	16	9	21	30	40	51	14	24	20	2	6	11	53	33	39	639	83	83	87	59	144	8	4	42
012	1	142	83	15	29	6	11	24	43	31	13	21	14	3	11	12	41	44	50	356	87	59	111	73	111	14	6	37
013	1	122	70	14	19	6	10	34	33	27	12	24	16	1	0	13	49	53	36	167	79	79	135	79	129	10	11	32
014	1	143	85	15	20	9	7	37	38	26	15	24	14	2	15	8	46	62	43	584	101	93	99	101	136	10	3	34
015	1	149	65	14	24	4	12	19	18	29	11	29	13	4	8	10	42	71	17	380	121	115	141	97	114	9	12	31
016	1	127	81	15	27	3	16	30	38	48	21	24	16	2	13	10	46	62	38	331	123	111	97	115	127	6	12	43
017	1	130	74	15	7	7	4	22	36	29	23	28	15	1	9	10	46	55	35	430	73	97	85	67	130	7	17	33
018	1	148	71	16	21	6	8	23	26	17	19	19	14	3	1	12	49	70	50	574	81	99	89	97	132	15	3	32
019	1	129	70	20	22	2	10	24	54	31	10	20	16	6	15	8	50	68	48	461	109	85	123	73	121	9	10	34
020	1	135	78	15	24	6	9	31	32	29	12	20	14	4	6	12	52	68	51	275	73	85	119	107	135	16	7	33
021	1	126	76	15	36	7	10	30	30	24	9	9	17	1	7	11	48	63	32	559	125	77	101	75	115	8	5	34
022	1	115	67	10	20	2	4	22	29	20	12	17	8	3	1	10	51	48	46	450	87	91	97	99	136	12	4	26
023	1	127	76	15	27	6	6	25	47	36	9	18	18	7	11	8	34	73	52	521	115	79	111	87	109	11	6	35
024	1	134	71	9	35	8	6	37	16	18	10	17	16	5	4	13	44	45	53	495	73	69	109	111	99	11	2	30
025	1	134	88	12	32	9	19	28	73	33	17	26	9	7	15	7	42	66	38	489	107	137	77	151	137	7	6	46
026	1	128	85	16	32	7	26	27	60	38	26	22	16	6	14	8	45	51	47	500	79	123	117	87	123	12	7	49
027	1	143	84	12	21	17	14	33	27	31	14	21	17	4	13	9	43	32	53	389	67	59	101	103	149	10	13	38
028	1	120	69	19	15	6	8	31	29	20	11	11	12	7	0	11	43	51	31	545	91	81	89	91	98	11	15	29
029	1	115	79	14	22	11	18	31	54	39	9	26	14	6	10	6	46	30	60	567	85	59	69	85	123	11	5	42
030	0	120	57	14	15	5	3	33	22	16	14	8	8	3	2	12	60	36	45	360	51	81	81	71	109	7	7	26

Subs.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
031	0	107	63	9	11	2	8	17	42	22	13	5	15	3	0	12	55	26	48	579	97	77	85	77	118	10	12	29
032	0	104	58	9	13	2	0	1	28	37	10	13	7	6	0	8	56	59	47	350	117	77	95	77	85	9	14	24
033	0	150	75	14	22	6	1	22	36	33	12	22	11	2	11	12	28	31	17	464	109	99	133	59	126	10	11	30
034	0	98	48	10	28	2	2	19	36	34	14	8	9	3	0	7	51	50	67	514	105	101	109	75	103	14	8	32
035	0	135	81	16	10	6	10	23	30	21	11	20	15	2	6	9	51	61	75	611	71	87	89	97	105	13	10	28
036	0	103	54	10	33	9	2	24	43	16	14	8	9	1	4	11	51	43	30	445	103	69	97	77	113	10	9	33
037	0	126	76	13	20	8	11	24	50	42	10	15	15	3	2	12	50	41	61	501	91	73	99	79	119	10	9	38
038	0	116	57	12	18	0	15	28	32	35	9	15	9	1	7	10	50	21	73	566	67	109	87	83	121	13	5	29
039	0	96	43	10	15	5	1	-3	11	10	11	6	6	0	0	10	57	27	58	350	15	69	75	95	102	9	7	19
040	0	117	58	12	14	6	4	26	35	39	8	13	11	2	1	12	62	45	36	362	77	77	77	60	111	12	10	29
041	0	108	63	12	22	4	6	14	39	39	14	9	15	4	1	12	39	20	40	560	81	111	121	67	103	13	8	35
042	1	96	46	10	5	12	0	28	15	18	11	4	12	2	3	9	47	51	50	202	107	113	95	107	96	14	8	21
043	1	116	72	16	19	11	14	22	47	26	10	13	16	1	3	12	50	7	50	372	103	297	109	105	116	11	8	36
044	1	119	46	12	4	3	16	20	21	19	7	21	17	0	0	10	47	37	60	350	99	105	105	77	83	13	11	22
045	1	121	55	14	20	16	21	16	21	29	12	16	16	1	8	15	46	37	55	295	81	97	101	117	126	10	8	37
046	1	122	63	13	14	11	17	17	30	27	17	16	9	4	6	8	44	71	48	474	111	77	91	101	108	10	8	37
047	1	130	66	13	23	3	8	17	22	23	10	12	17	4	5	7	41	51	61	384	87	123	91	93	117	9	5	28
048	1	97	56	13	29	12	15	37	41	30	12	8	5	2	4	6	47	59	61	350	79	85	101	101	85	12	3	41
049	1	125	78	10	14	9	27	31	40	26	6	13	14	1	0	9	61	48	57	350	69	71	101	57	125	10	3	32
050	1	127	75	11	27	17	13	36	44	40	11	10	12	1	5	8	53	58	54	258	71	107	107	101	118	14	8	43
051	1	122	68	17	24	9	8	30	42	29	12	14	13	5	2	8	46	66	59	395	91	85	77	67	118	13	9	36
052	1	99	47	10	19	2	5	20		27	17	14	13	4	3	7	47	57	69	380	91	97	93	93	77	16	7	30
053	1	102	49	9	22	0	4	29	21	23	11	6	15	1	3	7	49	47	52	689	69	63	81	113	110	11	4	24
054	1	97	44	11	0	4	5	25	9	9	11	13	7	0	2	14	62	31	60	350	139	109	133	123	112	13	8	17
055	1	128	66	16	12	12	0	30	14	34	10	23	15	1	6	4	53	9	47	530	97	75	119	79	122	19	7	26
056	1	90	57	14	1	5	11	21	20	25	10	25	10	5	3	10	56	54	59	187	103	59	95	101	110	7	7	24
057	0	119	61	9	13	5	9	38	36	37	7	8	15	3	4	7	51	55	36	513	69	87	123	107	112	17	7	30
058	0	106	52	11	16	8	5	23	47	29	14	13	16	2	0	9	43	30	28	255	85	73	109	69	111	10	8	36
059	0	93	41	9	10	4	0	17	34	26	21	8	16	5	1	10	38	40	45	232	81	87	107	111	102	15	15	28
060	0	109	52	9	16	6	12	33	29	17	12	11	11	1	1	11	54	30	35	514	99	87	115	73	95	13	11	95
061	0	106	58	13	26	11	17	11	43	29	13	8	14	6	4	14	34	63	58	573	75	85	111	79	109	13	9	41
062	0	134	77	17	19	5	8	33	25	39	13	14	16	2	1	13	50	58	63	211	113	77	91	83	134	9	7	34
063	0	104	52	17	14	4	5	23	24	29	11	14	14	2	1	12	54	48	56	441	99	73	111	93	96	12	8	28
064	0	103	55	11	34	12	2	18	31	18	5	11	5	1	2	12	51	51	52	219	101	71	81	77	103	14	8	28
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127	1	131	65	17	34	9	11	27	20	26	9	19	16	2	12	10	55	53	53	442	113	79	101	77	117	13	5	31
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141	0	118	63	12	23	10	7	30	38	35	14	11	17	5	15	14	34	33	49	374	59	91	89	77		17	10	37
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Subs.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
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165	0	128	78	2	40	9	11	17	38	30	18	12	9	0	11	11	51	28	35	275	111	107	123	89	128	13	8	41
166	0	112	47	9	21	18	7	15	21	35	15	8	13	5	4	7	34	28	0	350	107	91	127	101	132	13	8	37
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168	0	125	76	13	25	0	8	26	36	37	14	17	8	7	17	3	34	51	76	423	59	103	135	107	120	20	4	32
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172	0	124	64	14	11	1	8	30	13	11	15	13	9	1	10	11	42	51	46	189	85	93	123	107	89	12	9	21
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Subs.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
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